# REPORT ON BURMESE FISHES COLLECTED BY LT-COL. R. W. BURTON FROM THE TRIBUTARY STREAMS OF THE MALI HKA RIVER OF THE MYITKYINA DISTRICT (UPPER BURMA).[1]

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PART II.

(*With text-figures* 4 *to* 14).

(*Continued from page* 831, *volume* XXXVI).

FAMILY: HOMALOPTERIDAE.

**Homaloptera rupicola** (Prashad & Mukerji).

One specimen (36 mm.) from Phungin Hka: '*Nga Hpai*'.

In 1929 Prashad and Mukerji (45) established the genus *Chopraia* to accommodate a very remarkable form of Homalopterid fish, *Chopraia rupicola*, obtained from the rocky streams of Kamaing in the Myitkyina District in Upper Burma. Despite the form being closely related to the genus *Homaloptera*, the fish had to be given a separate generic position in view of certain distinctive features which, till the time of its discovery, had not been ascribed to the genus *Homaloptera*. In his preliminary observations on the classification of the Homalopterid fishes, Hora (36) recognised the genus *Chopraia* as valid and placed it in the sub-family Homalopterinae. Later, in his monographic revision of the Homalopterid fishes he (37) studied them in greater detail and defined the various generic and specific limits. His extensive studies of these fishes, including certain types preserved in different museums in England and in other countries, enabled him rightly to delimit the various genera and species. Of the genera of the family Homalopteridae *Homaloptera* embraces a vast majority of remarkable torrential fishes with similar or diverse adaptive modifications. Hora's collective survey of the whole group of these fishes justified his considerably extending the generic limit of *Homaloptera;* and *Chopraia* should now be considered a synonym of *Homaloptera* as emended by Hora.

The specimen under report agrees almost entirely with the specimens from the type-locality. The interorbital width is nearly equal to the diameter of the eyes. The pectoral fins reach the ventrals which are shorter than the former.

One important feature of *Homaloptera rupicola*, to which atten-

[1] Mr. Mukerji's paper was published in two parts because of the need of keeping down the number of pages in the *Journal*. The author was unaware of this arrangement by the Editors; hence several citations to the bibliography which is published at the end of the present part were made in Part I and again references will be found in the present part to plates Nos. I-III which were published with Part I in volume XXXVI.—EDS.

tion has so far not been paid, is that the anterior portion of the ventral surface up to the base of the ventral fins is perfectly horizontal and this area is either devoid of scales or the scales are rudimentary. The flat and the naked ventral surface, the *Balitora*-like horizontal position of the pectoral fins, and the general facies of the fish clearly indicate that the fish is an inhabitant of the rapids. The occurrence of the species in the Phungin Hka seems to be rather unusual, and the specimen may have drifted into the river from some of the rocky streams which abound in the neighbourhood.

FAMILY: COBITIDAE.

**Botia hymenophysa** (Bleek.).

One specimen (100 mm.) from Sinan Hka: '*Nga-shaba*'.
One specimen (98 mm.) from Tang Hka: '*Nga-pasi*'.

Hora (26) has already discussed at some length the affinities of *Botia berdmorei* of Blyth with *B. hymenophysa* of Bleeker and has considered them conspecific. I have also gone into the question and after a thorough re-examination of the specimens of the two species preserved in the collection of the Indian Museum I agree that *B. berdmorei* is the same as *B. hymenophysa*. The species is extremely variable in regard to the colour pattern, the position of the anal opening and the different body proportions at different stages of its growth and in specimens from different localities.

The two well-preserved specimens from the Mali Hka system have more or less the same colouration as that of *B. berdmorei* figured by Day in his *Fishes of India*. There are from 11 to 12 broad vertical black bands along the sides which pass over the back and join the corresponding ones on the other side. Series of fine black specks and dots are arranged more or less longitudinally all over the body. The dorsal fin is variegated with black bands and blotches. The caudal fin is clouded all over with black dots; it is devoid of any band. A few blackish dots are present on the anal fin also. The rostral barbels are black.

**Nemachilus botia** (Ham. Buch.) *sensu stricto*.

(Pl. I, fig. 1; Pl. III, figs. 3 & 4).

Two specimens (102 and 73 mm.) from Tang Hka: '*Sumbrun*'.
Two specimens (88 and 85 mm.) from Tang Hka: '*Sumbrum Chang*'.
One specimen (81 mm.) from Tang Hka: '*Taretu*'.
One specimen (63 mm.) from Phungin Hka: '*Nga Kalang*'.

In his revision of the fishes of the genus *Nemachilus* from Burma, Hora (33) has rightly pointed out that "many of the species of the genus exhibit considerable individual variability"; and so far as I can judge, *N. botia* is perhaps one of the most variable species. It is due chiefly, if not entirely, to the extreme variability of the species that its precise limits have not so far been properly understood and defined, and this has been responsible for considerable misapprehensions. Specimens of *N. botia* have often been erroneously considered to represent a different and distinct species, while others of an allied but distinct species have been referred to *N. botia*. In this connection mention should be made of *N. nebulosa* (Blyth), the short history of which, given below, clearly shows how baffling at times may be the identity of *N. botia*.

In 1860, Blyth (3) described a new Cobitid fish from a single specimen obtained from Darjiling and presented by Dr. Wallich, under the denomination *Botia nebulosa*. He considered the form to be closely allied to "*B. grandis* but with face shorter (as described) and eight cirri not quite so strongly developed". Günther, apparently due to having no access to the type-specimen of *B. nebulosa*, which was deposited and is still preserved in the collection of the Indian Museum, did not include *B. nebulosa* in the synopsis of the various species of the genus *Botia* in his *Catalogue* (19); but he referred to the species in a foot-note (p. 366) without any comments. In 1869, Day (10) examined the type-specimen and published a short account of *B. nebulosa*. He remarked that "a bifid erectile (damaged) suborbital spine" is present. Later, in his *Monograph of the Indian Cyprinidae* he (11) included a short description of the loach without any fresh comments. Both in his *Fishes of India* and in the *Fauna* volume, Day retained the species *B. nebulosa*, and emphasized in a foot-note (p. 606) that the "suborbital spine was damaged in the unique example". The species did not receive further attention till 1922, when in his revision of the fishes of the genus *Botia*, Hora (26) remarked that "On examination I am unable to refer it (*Botia nebulosa*) to the genus *Botia*. I believe that it belongs to *Nemachilus* and in all probability is a male of *N. botius*". Hora gave sufficient reasons for considering *B. nebulosa* to be a *Nemachilus* and pointed out that Day's contention regarding the suborbital spine being damaged in the type-specimen was rather far-fetched, for, "the groove that is present is not sufficiently deep to justify the view that it ever contained a spine. The groove is of the nature of a shallow slit partly covered superiorly by a fold of skin. I have already remarked in a previous paper that such grooves and folds of skin form the secondary sexual characters of certain species of *Nemachilus*". Owing to the paucity of adequate material of *N. botia* for comparison, it was, however, not possible for Hora to go into further details about the systematic position of *B. nebulosa*.

I have thoroughly examined the five specimens under report from the Mali river system and compared them with the specimens of *N. botia* obtained from different places of India and Burma and referred to by Hora in his revision of the genus, and I find that my specimens are referrable to *N. botia*. Recently Messrs. G. E. Shaw and E. O. Shebbeare have collected abundant material of *N. botia* from various streams and rivers of Northern Bengal, and have presented a fine series of them to the Indian Museum. I have examined these specimens and after comparing the type-specimen of *Botia nebulosa* with all the specimens of *N. botia* now at my disposal, I am thoroughly convinced that *B. nebulosa* is not only not a *Botia* but it is an absolute synonym of *N. botia*, of which almost all the adult males are provided with a suborbital groove, and that the presence of a spine in the suborbital groove of the type-specimen of the former was purely conjectural on the part of the earlier authors.

It may not be out of place to mention in this connection that recently Deraniyagala (17) has reported the typical form of *N. botia*

under the name *Nemacheilus botia botia* (Ham. Buch.) "from several small streams" in Ceylon. From his description of the fish and the figure it appears that the Ceylonese fish is strikingly allied to *N. botia;* but the fact that the typical form of the species has not so far been known to occur anywhere in Peninsular India, much less in Ceylon, throws a doubt on the accuracy of the specific position of the Ceylonese loach. Moreover, it is quite conceivable that similar environmental conditions may tend to produce similar characters, and that the great resemblance between *N. botia* of India and the one of Ceylon may be due to a similarity in their environments. In the absence of any specimen of Ceylonese *N. botia* for comparative study, it is, however, impossible to judge its affinities. It may yet be pointed out that according to Deraniyagala the base of the dorsal fin of the Ceylonese *N. botia* is "as long as head or pectorals, which latter usually reach ventrals" (p. 38). In all the Indian and the Burmese specimens that I have examined, the base of the dorsal is certainly almost as long as the head or the pectorals, but the pectorals which are invariably shorter than the head hardly reach the ventrals.

From the foregoing account it is quite clear that a certain amount of confusion centres round the true identity of *N. botia*. The species, as it is understood in the present state of our knowledge, is widely distributed in the Indian and the Burmese waters. Below I have given, for future reference, a more or less detailed description of the species from materials from India and Burma. In view of the fact that no adequate figure of the loach has so far been published I take this opportunity to give figures from a well-preserved specimen from the Mali Hka system.

D. 3/11; A. 3/5; P. 1/11; V. 1/7; C. 18 (excluding the small compact outer rays).

The dorsal profile rises from the tip of the snout to the insertion of the dorsal fin with a sudden rise above the orbit. Behind the origin of the dorsal, the outline slopes down slowly, falls appreciably just beyond and below the end of the dorsal base, and then rises up again to the root of the caudal fin. The ventral profile is uniformly and faintly convex. The body is of rather stout build, spindle-shaped and compressed from side to side. It is thinnest at the caudal peduncle, which is squarish in shape and slightly higher than long. The greatest depth of the body is contained from 4.5 to about 5.2 times in the length of the body without the caudal fin. The head is moderate, its length being contained approximately from 4.2 to 4.5 times in the length of the body. It is slightly broader than high. The snout is prominent and somewhat blunt anteriorly. Its length is contained about 2.5 times in the length of the head. The eyes are rather large, placed high and nearer to the angle of the operculum than the tip of the snout. In some grown-up individuals they may be situated almost in the middle of the head. They are scarcely visible from the ventral surface. The orbital width is contained approximately from 3.8 to 5 times in the length of the head. The interorbital space is flat to faintly concave and is almost equal to or slightly narrower than

the diameter of the eyes. In front of and below the orbit on either side is a transverse subcutaneous ridge-like prominence. Usually there is no definite groove below the ridge, but in case of most adult male specimens a moderately deep groove is discernible. The nostrils are situated nearer the anterior margin of the orbit than the tip of the snout. The anterior ones are provided with well-developed tubular flaps. The mouth is sub-inferior, moderate and horse-shoe-shaped. The lips are rather fleshy and continuous at the angles of the mouth. The upper lip is provided with a few rows of small fleshy papillae, while the lower one has two rounded, raised cushion-like clusters of similar papillae situated centrally. The lower lip is interrupted in the middle. Both the lips are capable of being partly everted off from the jaws. The upper jaw is slightly longer than the lower and partly overhangs it. Both the jaws are provided with thin and sharp horny edges. The upper one is in the form of a small beak, while the lower one is shovel-shaped with a faint symphysial emargination to receive the upper jaw.[1] The gill openings are in the form of vertical slits extending below the insertions of the pectoral fins. There are two rostral and one maxillary pairs of barbels which are fairly well-developed. All the barbels are much longer than the orbital width.

Usually the insertion of the dorsal fin is much nearer the tip of the snout than the base of the caudal fin, but in some specimens, irrespective of age and locality, it may be situated almost in the middle of the same two points. It is long and in most cases longer than high. The length of its base is equal to that of the head or slightly shorter. Its outer margin is straight and oblique. The paired fins are inserted sub-horizontally. The pectorals are generally shorter than the head and are separated from the origin of the ventrals by a variable distance. The ventrals are situated almost vertically below the middle of the dorsal fin and are shorter than the pectorals. They are separated from the commencement of the anal by a considerable distance. The anal fin is short and when laid flat reaches the base of the caudal or just misses it. The pectorals, ventrals and the anal fins have rounded outer margins. The caudal fin is as long as, or a little longer or shorter than the head. It is longer than high, and faintly emarginate, with somewhat rounded lobes. The anal opening is variable in position, but in most cases it is situated almost midway between the tip of the ventrals and the origin of the anal fin.

The scales are of small to moderate size, conspicuous and imbricate. They are absent on the head and considerably reduced on the chest. The lateral line is generally complete, but in some cases it may be incomplete, not extending beyond the anal fin.

The colouration of the species is very variable, and not unlike most of the other loaches, it depends on the nature of the water

[1] So far as I am aware, such characters of the jaws are found more pronounced in the fast stream-dwelling species of the genus *Nemachilus*. In such habitats as the fish feed almost entirely by scraping and rasping off algae and other organic matters from the rocky substratum, such modifications of the jaws are of the utmost utility.

and other environmental conditions. Ordinarily, the ground colour is pale olivaceous to yellowish orange with 12 to 16 blackish cross-bars of various turns and twists, descending a little below the level of the lateral line. These bands are generally uninterrupted in the young and half-grown specimens, while in adults they may be broken up into patches, scattered irregularly on the sides. A narrow dark band joins the tip of the snout and the anterior margin of the eyes. Another similar band is present dorsally between the eyes. A prominent black ocellus is usually to be found on the upper base of the caudal fin. All the barbels are dusky, excepting the maxillaries which are white. The fins are yellowish. The dorsal has 5 to 6 oblique, zigzag narrow blackish bands, while the caudal is provided with 5 to 7 posteriorly directed V-shaped dark bands.

*Measurements in millimetres:*

| | Northern Bengal | | | Mali Hka System | | |
|---|---|---|---|---|---|---|
| Length of body without caudal. | 70·0 | 57·0 | 50·0 | 102·0 | 88·0 | 63·0 |
| Height of body ... ... | 15·0 | 12·5 | 10·0 | 18·0 | 18·0 | 12·0 |
| Length of head ... ... | 16·0 | 13·0 | 11·5 | 21·0 | 19·5 | 14·0 |
| Breadth of head ... ... | 11·0 | 9·0 | 7·0 | 18·0 | 13·0 | 10·5 |
| Height of head ... ... | 10·0 | 8·0 | 7·0 | 14·0 | 11·5 | 9·0 |
| Length of snout ... ... | 7·0 | 5·0 | 4·0 | 10·0 | 7·0 | 6·0 |
| Diameter of eye ... ... | 3·5 | 3·0 | 3·0 | 4·0 | 4·0 | 3 0 |
| Interorbital width ... ... | 3·0 | 3·0 | 2·0 | 4·5 | 3·5 | 3·0 |
| Height of dorsal fin ... | 15·5 | 13·0 | 12·0 | 19·0 | 18·5 | 12·0 |
| Length of pectoral fin ... | 15·0 | 12·0 | 11·0 | 18·0 | 16·0 | 11·5 |
| Length of ventral fin ... | 11·5 | 9·5 | 9·0 | 17·0 | 14·0 | 17·0 |
| Length of anal fin ... ... | 11·5 | 8·0 | 8·5 | 17·0 | 13·5 | 11·0 |
| Length of caudal fin ... | 16·0 | 13·0 | 11·0 | 22·0 | 18·5 | 13·0 |
| Length of caudal peduncle ... | 8·0 | 6·0 | 6·0 | 12·0 | 10·5 | 7·0 |
| Least height of caudal peduncle ... ... | 10·0 | 8·0 | 7·0 | 14·5 | 13·0 | 9·0 |

**Nemachilus paucifasciatus** Hora.

One specimen (51 mm.) from Phungin Hka: '*Nga Samwiyit*'.

In 1929, Hora (33) described this species from 15 specimens obtained by Dr. J. Coggin Brown from Hwe-gna-sang river in the Hsipaw State of the Northern Shan States. The single specimen collected from the tributary of the Mali river, which I assign to *N. paucifasciatus*, does not differ from the description and figure of the species excepting that the inner rostral barbels do not extend "as far as the nasal opening". They are much shorter, and the outer rostrals, instead of being extended to "below the middle of the eyes" reach only to the nasal opening.

**Nemachilus multifasciatus** Day *sensu lato*.

One specimen (50 mm.) from Phungin Hka: '*Sambrun*'.

In his *Fishes of India*, Day described this species from "Darjeeling and Assam"[1] and published an illustration of the fish from

[1] Dr. S. L. Hora kindly informs me that during his visit to Europe he had examined a specimen (No. '89.2.1.1669') in the collections of the British Museum (Nat. Hist.) which is labelled in Day's hand-writing as *Nemachilus multifasciatus*. The specimen was collected by Day from Assam.

a specimen from Darjiling (pl. cliii, fig. 7). In 1889, Vinciguerra (53) reported the species from 'Meekalan' and 'Thagata Juva' near Moulmien in Burma. In his revision of the fishes of the genus *Nemachilus* from Burma, Hora (33) briefly observed that Vinciguerra's specimens from Burma have, in all probability been wrongly referred to *N. multifasciatus* and that the fish "appears to represent a new species". Unfortunately, the unique type-specimen of *N. multifasciatus* from Darjiling which is still preserved in the collection of the Indian Museum is in such a state of maceration that it has become useless for all taxonomic purposes. Moreover, the species seems to be so very rare that since Day's discovery it has not been, leaving aside Vinciguerra's record from Burma, reported again from the Darjiling Himalayas or the adjoining areas, although fairly extensive collections of similar fishes have been made in these areas from time to time by parties of the Zoological Survey of India, and very recently by Messrs. G. E. Shaw and E. O. Shebbeare. Day's descriptions and figures of *Fishes of India*, in general, have been found to be so indefinite and inaccurate that it is often impossible to judge the precise limits of a species without having fresh specimens from the type-locality as a check. Under these circumstances nothing can be said definitely in regard to the specific limits of Day's *N. multifasciatus*, and the fish must be understood and shall remain provisionally known from whatever descriptive accounts it has to its credit until such time as the typical form is again obtained and definitely studied. It seems justifiable, therefore, to make reasonable allowance, so far as this fish is concerned, for minor differences in body proportions and colouration, etc., rather than to consider these as differentiating characters.

Sometime ago, Dr. D. Vinciguerra of the Genova Museum kindly presented a specimen of his Burmese *N. multifasciatus* to the Indian Museum. I have thoroughly examined the specimen and I am in agreement with Hora's view that the fish, judging it by Day's description of *N. multifasciatus*, appears to be new, differing from the latter chiefly in certain body proportions. But in view of what has already been said about the merit of Day's accounts and of the well-known plasticity of shape and structure under variable environmental conditions, of the stream-dwelling loaches in general, I do not propose to separate the Burmese *N. multifasciatus* from the one of India. As for the difference in colouration of the Burmese form, it is to be regarded as no more than a racial character, for, it is well known that most of the freshwater fishes of Burma have a characteristic brilliance of colouration.

In Colonel Burton's collections from the Mali Hka system there is a single specimen which is inseparable from Vinciguerra's specimen from 'Meekalan', although it differs somewhat in colouration.

Quite recently, Dr. H. M. Smith, of the Fisheries Department, Bangkok, Siam, collected several specimens of a species of *Nemachilus* from Northern Siam and sent a fine series to Dr. S. L. Hora for study and opinion. In forwarding the specimens Dr. Smith wrote that the fish "seems to be close to *multifasciatus*. It agrees in (1) very short barbels, (2) short pectorals,

(3) shape of caudal, (4) complete lateral line, (5) black bar at base of caudal and (6) general colouration, but (1) is more slender and (2) colouration of fins different''. Having examined these Siamese specimens and after comparing them with Vinciguerra's form Dr. Hora informed Dr. Smith in a letter that the Siamese fish ''is undoubtedly *N. multifasciatus* of Vinciguerra (but not of Day)'' and that ''Vinciguerra's *N. multifasciatus* appears to represent a new species'', of which he already had a description written and an illustration made with a view to publish them under a new specific name.

I have also examined the same Siamese specimens, temporarily retained in the Indian Museum for study, and find that they are indistinguishable both from the 'Meekalan' specimen and the one from the Phungin Hka tributary of the Mali river under report and that all these specimens should be referred to one species. But as to whether they are referable to Day's *N. multifasciatus* or to a new species appears to be only a matter of opinion. In the present state of our knowledge of the fish in question, I am personally inclined to refer both the Burmese and the Siamese forms to *N. multifasciatus*. In case it is proved by future studies, based on adequate material, that the typical form of Day's *N. multifasciatus* is specifically distinct from the Burmese and the Siamese forms, the latter may be ranked as a separate species and the following description of the fish from the data before me as also the figure of the 'Meekalan' specimen to be published elsewhere by Dr. Hora will be of help in understanding the affinities of these fishes.

D. 3/8; A. 3/5; P. 1/11; V. 1/7; C. 19 (excluding small compact outer rays).

The profile in front of the dorsal fin is moderately arched, beyond which it is almost straight or a little sloping to the root of the caudal fin. The ventral profile is more or less horizontal or very slightly convex. The body is of a rather slender build, elongated and narrow. It is somewhat compressed from side to side, being thinnest at the posterior end of the caudal peduncle, which is squarish in shape and invariably as long as high. The utmost height of the body is contained from 5.5 to 6.5 times in the total length without the caudal fin. The head is short and a little broader than high; its length is contained from 4.8 to 5.2 times in the length of the body. The snout is moderate and pointed anteriorly. Its length is contained from 2.5 to 3 times in the length of the head. The eyes are small and situated almost in the middle of the distance between the tip of the snout and the angle of the operculum. They are not visible from the ventral surface. The orbital width is contained from 4 to 5.4 times in the length of the head. The interorbital space is usually slightly convex, but in certain adult specimens it may be almost flat. It is generally narrower than the diameter of the eyes. The nostrils are situated much nearer the anterior margin of the orbit than the tip of the snout. They are partitioned by a moderate and thin flap.

The mouth is sub-inferior, arched and of moderate size. The upper jaw is slightly longer than the lower one, and partly overhangs the latter. Both the jaws have sharp horny edges. The upper one is in the form of a small beak, while the lower is somewhat shovel-shaped with a symphysial emargination to receive the beak of the upper jaw. The upper lip is rather short and thin. The lower one is better developed and has faint longitudinal striations in the middle. The lips are continuous at the angles of the mouth. The upper one is capable of being partly everted off the jaw. The lower one is moderately united to the isthmus. The gill-openings are in the form of slightly curved slits, extending from the insertion of the lateral line to below the bases of the pectorals. There are three pairs of short barbels. The outer rostrals are slightly longer than the inner, but are almost equal to the maxillaries.

The dorsal fin is inserted midway between the tip of the snout and the base of the caudal fin or just a little nearer to the former. It is shorter than high, the length of its base being almost equal to the length of the head behind the nostrils; its height is slightly less than the depth of the body below it. The outer margin is straight or very slightly curved. The paired fins are placed subhorizontally. The pectorals are generally shorter but in some specimens they may be equal to or even a little longer than the head. They are separated from the origin of the ventrals by a distance equalling about half their own length. The ventrals are situated vertically below or a little behind the origin of the dorsal. They are shorter than the pectorals and are separated from the commencement of the anal by a variable distance. They invariably reach as far as the anal opening, which is situated much nearer the origin of the anal than that of the ventrals. The outer margins of the paired fins are somewhat rounded. The anal fin is short and when laid flat it may almost reach the root of the caudal or may be separated from it by a short space. The caudal fin is usually longer than the head, but in some specimens it may be of equal length. It is longer than high and moderately emarginate with more or less equal and blunt lobes.

The scales are rather small and imbricate, but are not inconspicuous. They are more prominent on the posterior half of the body. The head and the chest are without scales. The lateral line is complete.

In regard to the colouration of *N. multifasciatus*, Day (14) observed that "vertical bands as wide as the ground colour pass from the back to the lower surface of the abdomen, *those between the head and the dorsal fin are numerous,* whilst there are about five posterior to it. *In some examples these anterior bands coalesce. A dark band at the base of the caudal* and dark marks on the head radiating from the eye. Fins yellow, the dorsal with four bands of spots and an equal number or more on the caudal. Ventral and anal with two bands each". (Italics are mine.). I find that the colouration of the Burmese and the Siamese specimens does not differ much from Day's description except for the number and the nature of the bands on the body and on the fins. In

most specimens the colouration of the different fins is lost in alcohol. In a couple of specimens from Siam, however, I find two distinct blackish bands on the dorsal and two on the caudal fin. Both the ventrals and the anal fins have a faint and narrow band. The characteristic dark band at the root of the caudal fin is present in all the specimens.

*Remarks*: From the present data it may be inferred that *N. multifasciatus* is more common in Burma and in Northern Siam than in the Eastern Himalayas, and that in all probability it is essentially a species of the Burmese and the Siamese waters, its range extending from these areas through Assam to the Darjiling Himalayas. Under normal circumstances, the density of population of a species of fish in any area is found to be inversely proportional to the distance between the centre of distribution and the area concerned. The extreme rarity of the species in the Eastern Himalayas and particularly in the neighbourhood of Darjiling, where fairly extensive collections have been made, seems to corroborate this view.

*Measurements in millimetres.*

| | Meekalan | Phungin Hka | Northern Siam | | |
|---|---|---|---|---|---|
| Length of body without caudal ... | 52·0 | 50·0 | 66·0 | 48·0 | 36·0 |
| Height of body ... ... | 8·5 | 8·0 | 10·0 | 8·0 | 6·5 |
| Length of head ... ... | 10·0 | 10·0 | 13·5 | 10·0 | 7·5 |
| Breadth of head ... ... | 7·5 | 7·0 | 9·0 | 6·5 | 5·0 |
| Height of head ... ... | 6·0 | 5·5 | 7·0 | 5·0 | 4·0 |
| Length of snout ... ... | 4·0 | 4 0 | 4·5 | 4·0 | 2·5 |
| Diameter of eye ... ... | 2·5 | 2·0 | 2·5 | 2·0 | 1·5 |
| Interorbital width ... ... | 1·5 | 1·5 | 2·5 | 1·5 | 1·0 |
| Height of dorsal fin ... ... | 9·5 | 9·0 | 13·0 | 8·0 | 7·0 |
| Length of pectoral fin ... | 11·5 | 8·5 | 13·0 | 8·0 | 7·0 |
| Length of ventral fin ... | 10·0 | 8·0 | 11·5 | 8·0 | 6·0 |
| Length of anal fin ... ... | 18·0 | 17·0 | 10·5 | 17·5 | 6·0 |
| Length of caudal fin ... ... | 12·0 | 11·0 | 15·5 | 10·0 | 7·5 |
| Length of caudal peduncle ... | 6·0 | 7·0 | 9·5 | 7·0 | 4·5 |
| Least height of caudal peduncle. | 6·0 | 6·5 | 9·0 | 6·0 | 4·5 |

**Nemachilus kangjupkhulensis** Hora.

One specimen (48 mm.) from Tang Hka: '*Zaibru Htu*'.

The species was discovered by Hora (23) in 1921 from the hill-streams of the Manipur Valley where it is said to be "widely distributed". The single specimen from the Tang Hka tributary of the Mali river, which I assign to this species, does not appear to differ in any essential feature from the description of the fish given by Hora or from the type-specimen which I have examined. The colouration of the Burmese specimen is partly lost in alcohol, but it seems to correspond almost entirely to that of the Assamese individuals. The lateral line extends to the commencement of the ventral fins.

The species is recorded here for the first time from Burma.

Family: Cyprinidae.

Genus: **Garra** Hamilton Buchanan.

When urging the revival of the oldest available generic names Jordan (39) pointed out that Hamilton Buchanan's *Garra* (1822) is a valid genus and it replaces *Discognathus* Heckel (1842). In his elaborate studies of the fishes of the genus *Garra*, Hora (24) discussed the matter in detail and stressed the validity of the genus *Garra* and pointed out its relationships with the allied genera. This removed the confusion that till then obscured the true status of the names *Garra* and *Discognathus;* and it was due entirely to this confusion that an indiscriminate use of both the names *Garra* and *Discognathus* found place in ichthyological literature. It is unfortunate, however, that some ichthyologists still uphold the name *Discognathus*, which despite its being more significant and suitable for the disc-mouthed fishes than *Garra*, has no nomenclatural status.

Bleeker (2) divided the genus *Garra* into two groups *viz*., *Garra* and *Discognathus* according as the fish have four or two barbels. Subsequently, Garman (18) suggested a third group for such forms as *G. imberbis* Vinciguerra in which the barbels are absent. He called it *Agenciogarra*. It appears to me far too artificial and quite unnecessary to split the genus *Garra* into three subgenera on the character of the barbels alone. It is a well known fact that barbels are very variable structures, specially among Cyprinoid fishes. Recently, Rendahl (49), however, has recognised these subgeneric divisions.

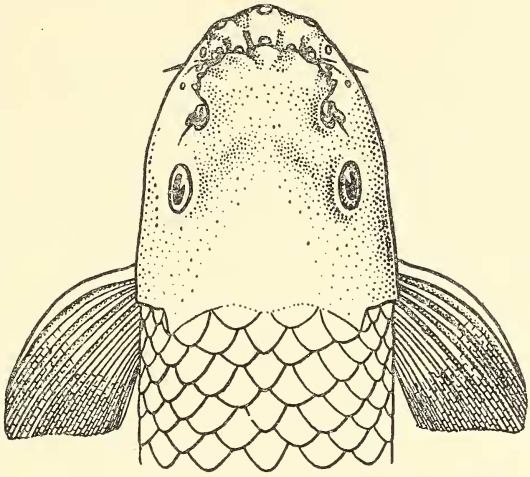
**Garra lamta** (Ham. Buch.) *sensu lato*.

One specimen (116 mm.) from Phungin Kha: '*Wuh tang*', 'Bulldog mouth'.

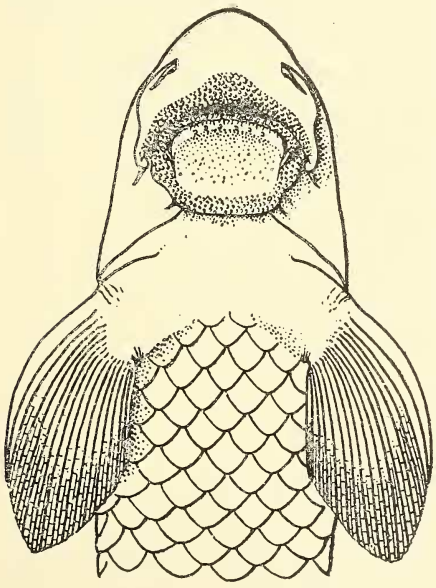
The proboscis is trilobed (Text-fig. 4). The central lobe is flat dorso-ventrally and occupies the greater portion of the snout. The

lateral lobes are small and are partly overhung by the central lobe. A deep groove marks off the tip of the snout. The anterior portion of all the lobes and the tip of the snout are covered with sharp spiny tubercles. The eyes are dorso-lateral in position and are placed wholly in the posterior half of the head.

I have compared the specimen from the Phungin Hka with one of Vinciguerra's *G. lamta* (53) from 'Meekalan' in Burma and have found that the specimens agree in every detail except for the proboscis, which is bilobed in the Meekalan specimen.



Text-fig. 4.—Dorsal view of the anterior portion of the head and body of *Garra lamta* (Ham. Buch.) from the Mali Hka system showing the nature of the proboscis and the tubercles on the snout, ×1½.



Text-fig. 5.—Ventral view of the anterior portion of the head and body of *G. lamta* showing the nature of the mouth, the lips and the suctorial disc, ×1½.

*Remarks*: I provisionally refer the specimen under report to this species as it cannot be reconciled with any other known species of the genus found within the limits of the Indian Empire. Moreover, it has a closer affinity with *G. lamta* than with any other species. *G. lamta* has so far been considered as a composite form. When, however, Buchanan's (20) typical '*Cyprinus* (*Garra*) *lamta*' has been properly understood and defined this form as well as Vinciguerra's *G. lamta* from Meekalan may turn out to be a new species.

### Crossochilus latius

(Ham. Buch.).

Two specimens (109 and 119 mm.) from Phungin Hka: '*Nga Lum*'.

The species was originally described by Hamilton

Buchanan in his *Gangetic Fishes* (20) from the "Tista" river at the base of the Darjiling Himalayas under the name '*Cyprinus latius*'. He placed the species in his 9th Division,—'*Cyprinus Garra*', because of certain morphological features and habits that the fish has in common with some species of *Garra*. That Buchanan was not far from the truth in considering *C. latius* a fish of the 'Garra kind" is proved by the fact that later researches have led most authors tentatively to believe that *Garra* has evolved from a *Crossochilus*-like ancestor. It has been shown by Hora (24) that in certain species of *Garra*, at any rate, the structure of the air-bladder and the skeleton of the mouth-parts resemble those of *Crossochilus*.

Since the discovery of the species from Northern Bengal, the range of its distribution has been extended to "Nepaul and Assam" (11) and to "Sind, Orissa, N.-W. Provinces, Punjab, Deccan and along the Himalayas" (14). In 1890, the species was recorded for the first time from Burma by Vinciguerra (53).

After examining a large series of specimens of *C. latius* from different places of India and Burma, preserved in the collection of the Indian Museum, I indicated in an earlier paper (42) that "the species is very variable in respect of the shape of the head and the body and the lepidosis". But in the absence of any specimens from the type-locality it was not possible for me to go into greater details. Quite recently, however, Messrs. G. E. Shaw and E. O. Shebbeare have collected a fine series of *C. latius* from streams and rivers below Darjiling and have kindly presented several well-preserved specimens to the Indian Museum. Having examined these specimens, practically from the type-locality, I am more than ever convinced that it is necessary to draw a distinction between the group of individuals of *C. latius* found, on the one hand, along the Eastern Himalayas, *i.e.* in Northern Bengal, Assam and in Burma, and, on the other, those that are distributed in the Punjab and the N.-W. Provinces. Furthermore, the Assamese and the Burmese forms differ in certain noteworthy characters from the typical form. No specimens from Orissa, Sind and Deccan are available for examination at the present moment and it is, therefore, not possible to comment on them. Below I have given for future reference detailed descriptions of (i) the typical form of *C. latius* from Northern Bengal, (ii) the Assamese and the Burmese form and (iii) of the form from the Punjab.

**Forma typica :**

D. 3/8; A. 2/5; P. 1/13; V. 1/8; C. 18 (excluding the small compact outer rays); L. l. 37-42; L. tr. 10 ($5\frac{1}{2}/4\frac{1}{2}$).

The body is more or less elongate. The dorsal profile rises slowly from the tip of the snout to the point of insertion of the dorsal fin, beyond and behind which it gradually converges to the root of the caudal fin. The ventral outline is horizontal or slightly curved. The head is small, flat and compressed, and resembles that of *Garra*. It is considerably longer than broad and almost as broad as deep. Its length is contained from 5 to 5.2 times in

the length of the body without the caudal fin. The snout is very prominent, obtusely pointed, smooth, and overhanging the mouth. Its length is contained from 2.2 to 2.4 times in the length of the head. The eyes are fairly large and situated nearer the angle of the operculum than the tip of the snout. They are not easily visible from the ventral surface. The orbital width is contained from 3.6 to 3.7 times in the length of the head. The interorbital space is rather wide and convex and is much wider than the diameter of the eyes. The nostrils are situated nearer the anterior margin of the eyes than the tip of the snout. The gill-openings are moderate, extending from the anterior point of insertion of the lateral line to a short distance below the base of the pectorals. They are broadly attached to the isthmus.

The mouth is inferior and its opening is slightly arched. The upper lip is in the form of a fairly broad and crenulated fold overhanging the vestibulum of the mouth. Numerous round and soft papillae are arranged more or less regularly towards its free border. The lower lip forms a median, elevated and fleshy area slightly arched anteriorly. It is not separated from the isthmus and is covered at its anterior border with papillae similar to those of the upper lip. There is no distinct post-labial groove, and usually the lower lip is not connected with the upper.[1]

A pair of rostral barbels, which are usually shorter than the diameter of the eyes, are always present. For the most part they remain hidden inside a moderately deep lateral groove on either side of the snout. These lateral furrows may be indistinctly connected with the angles of the mouth.

The insertion of the dorsal fin is considerably nearer the tip of the snout than the base of the caudal fin. It is almost equidistant from the tip of the snout and the middle or the posterior edge of the base of the anal fin. It is higher than the maximum depth of the body and the length of its own base. Its last unbranched ray is weak, and the last branched ray is divided to the root. The outline is slightly concave. The pectoral fins are nearly as long as the head or a little longer. They are separated from the base of the ventrals by a distance equalling almost half their own length. When fully expanded they have a more or less rounded outer margin. The ventrals are slightly shorter than the pectorals, and are situated vertically below the 3rd or the 4th branched ray of the dorsal fin. They are separated from the commencement of the anal by a distance equalling about half their own length. The anal fin is short and is separated from the root of the caudal by a moderate distance. The caudal fin is strongly furcate, the upper lobe being usually longer than the lower. It is longer than the head and almost as long as high. The anal

[1] In a number of specimens from the streams of Manipur in Assam, 25 to 45 mm. long, I have observed that there is a well-defined post-labial groove and a distinct connection of the lower lip with the upper; and it seems highly probable that these characters become obliterated as the fish grows. Unfortunately, young specimens from Assam, as well as from other places, are not represented in a sufficient number in the collection of the Indian Museum for a detailed study.

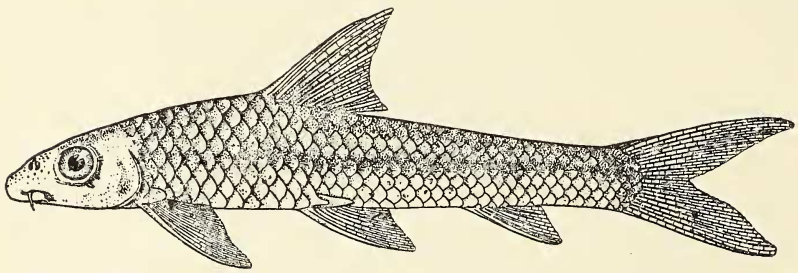
opening is variously situated. In most specimens the ventral fins extend considerably beyond it, while in others they just reach it.

The scales are of moderate size and arranged regularly. There are from 10 to 11 scales before the dorsal fin and usually from 18 to 19 round the caudal peduncle. The scales on the chest are considerably reduced in size, while those situated between the bases of the pelvic fins are somewhat enlarged. The lateral line is more or less straight and extends to the middle of the base of the caudal fin.

Colouration in alcohol is uniformly blackish above the insertion of the lateral line and whitish to faint orange below. The dorsal and the caudal fins are dusky. The other fins are almost colourless.

### Assamese and Burmese form :

I have examined a large series of specimens from Assam collected by Dr. S. L. Hora from various streams in Manipur, and from Burma only three specimens, one from the Kyenchaung river in the Mergui District and two from the Phungin Hka in the Myitkyina District. So far as I can judge, the specimens from these two places do not differ in any essential characters from the typical form except in scalation and in the proportion of the



Text-fig. 6.—Lateral view of *Crossochilus latius* (Ham. Buch.) from the Mali Hka system, $\times\frac{2}{3}$.

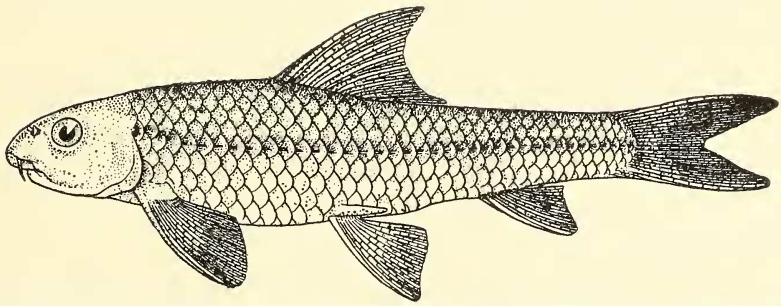
head in the length of the body. In most specimens from Assam and in all the three Burmese individuals I have counted only 8 scales ($4\frac{1}{2}/3\frac{1}{2}$) in a transverse series and from 15 to 16 round the caudal peduncle. In some of the Assamese individuals, however, there may be one more scale in a transverse row. In the typical form there are, as already mentioned above, 10 scales in a transverse series and from 18 to 19 round the caudal peduncle. The head of both the Assamese and the Burmese form is comparatively longer than that of the typical form. Its length is contained from 4.3 to 4.8 times in the length of the body without the caudal fin (*versus* 5 to 5.2 times).

These differences, however, in the number of scales and in the proportion of the head to the length of the body, do not, in my opinion warrant a claim of a separate taxonomic position for the Assamo-Burmese group of individuals of *C. latius*, and I am inclined to consider them no more than local variations.

**Punjab form :**

I have examined[1] a large series of specimens of *C. latius* from the Punjab collected by Drs. S. L. Hora and H. S. Pruthi from Katas Nallah, Salt Range and Khewra Gorge (about 2,000 ft. elevation), and as far as I can judge from the material before me, they seem to represent a distinct form from the typical *C. latius*. In my opinion the specimens from the Punjab, at any rate, should be kept as a separate subspecies until the chief differential characters noted below can be correlated with the ecological conditions in which the fish lives. For the subspecies I propose the name **punjabensis.**

*C. latius punjabensis* appears to be a dwarf form, the largest specimen at my disposal from the Salt Range is 136 mm. in length. On dissecting a number of female specimens from 30 to 45 mm. in length I have found ripe eggs. Unlike the typical form, the fish is stout and thick in build. The snout is rather blunt and broadly rounded anteriorly. It is not so prominent as in the typical form, and only slightly, if at all, overhangs the mouth. Its length is contained nearly 2.5 times in the length of the head. The length



Text-fig. 7.—Lateral view of *Crossochilus latius punjabensis*, subsp. nov., slightly reduced.

of the head is contained from 4.5 to about 5 times in the length of the body without the caudal fin. The eyes are comparatively small and their diameter is contained from 4.2 to 4.7 times in the length of the head (*versus* 3.6 to 3.7 times). The fold of the upper lip is relatively shorter and less crenulated, and so is the lower lip. The body is usually considerably deeper than the height of the dorsal fin (*versus* dorsal fin higher than the maximum depth of the body). The pectoral fins are usually shorter than the length of the head (*versus* equal to or slightly longer) and consequently, the distance between the tip of the pectorals and the insertion of the ventrals is much greater than half the length of the former.

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[1] Since this report went to the press, the Zoological Survey of India received for determination a small collection of fish from Quetta from the Deputy Research Entomologist, Baluchistan. In the collection I found six specimens of different sizes, which correspond to the Punjab subspecies of *C. latius*. I am, therefore, inclined to think that the two specimens of '*Cirrhina latia* H.B.' reported by Zügmayer (*Die Fische von Balutschistan*, p. 24, Munchen, 1913) from Quetta and Kushdil Khan respectively, are also referable to *C. latius punjabensis*.

*Measurements in millimetres:*

| | Northern Bengal. | | | Manipur, Assam. | | | Burma. | | | Salt Range, Punjab. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of head without caudal ... ... | 120·0 | 105·0 | 92·0 | 105·0 | 83·0 | 50·0 | 150·0 | 119·0 | 109·0 | 90·0 | 80·0 | 68·0 |
| Height of body ... ... ... ... | 25·0 | 24·0 | 20·0 | 23·0 | 18·0 | 10·0 | 35·0 | 23·0 | 21·0 | 24·0 | 18·0 | 17·0 |
| Length of head ... ... .. ... | 24·0 | 21·0 | 18·0 | 23·0 | 18·0 | 11·5 | 31·0 | 25·0 | 22·5 | 19·0 | 16·0 | 15·0 |
| Breadth of head ... ... ... ... | 15·5 | 15·0 | 12·0 | 15·0 | 11·0 | 7·5 | 21·0 | 16·0 | 15·5 | 15·0 | 13·0 | 11·0 |
| Height of head ... ... ... ... | 16·5 | 16·0 | 13·0 | 16·5 | 12·0 | 8·0 | 22·0 | 17·0 | 16·5 | 16·0 | 14·0 | 12·0 |
| Length of snout ... ... ... ... | 10·0 | 9·0 | 8·0 | 10·0 | 7·5 | 4·0 | 14·0 | 11·0 | 9·0 | 7·0 | 7·0 | 5·5 |
| Diameter of eye ... ... ... ... | 6·5 | 6·0 | 5·0 | 5·5 | 4·0 | 3·0 | 8·0 | 7·0 | 6·5 | 4·0 | 3·5 | 3·5 |
| Interorbital width ... ... ... ... | 8·0 | 8·0 | 6·0 | 8·5 | 6·0 | 3·5 | 11·0 | 9·0 | 8·0 | 8·0 | 7·0 | 6·0 |
| Height of dorsal fin ... ... ... | 31·0 | 28·0 | 23·0 | 25·0 | 19·0 | 12·0 | 36·0 | 30·0 | 29·0 | 20·0 | 20·0 | 17·0 |
| Length of pectoral fin ... ... ... | 24·0 | 22·0 | 18·0 | 19·0 | 16·0 | 10·0 | 30·0 | 22·5 | 21·0 | 18·0 | 18·0 | 15·0 |
| Length of ventral fin ... ... ... | 22·0 | 19·0 | 17·0 | 18·5 | 15·5 | 8·5 | 29·0 | 22·0 | 19·0 | 16·0 | 15·0 | 13·5 |
| Length of anal fin ... ... ... ... | 20·0 | 18·0 | 17·0 | 15·5 | 12·0 | 8·0 | 27·0 | 19·0 | ... | 14·0 | 13·0 | 12·0 |
| Length of caudal fin ... ... ... | 28·0 | 28·0 | 24·0 | 23·0 | 20·0 | 13·0 | 44·0 | 28·5 | ... | 24·5 | 20·5 | 19·0 |
| Length of caudal peduncle ... ... ... | 20·0 | 18·0 | 14·0 | 15·0 | 14·0 | 7·0 | 22·0 | 19·0 | 17·0 | 12·0 | 11·0 | 9·0 |
| Least height of caudal peduncle ... ... | 12·0 | 11·5 | 9·5 | 12·0 | 9·0 | 5·5 | 15·5 | 12·0 | 11·0 | 10·0 | 8·5 | 8·0 |

**Labeo (Labeo) dyocheilus** (McClell.).

(Pl. II, figs. 2 & 3; Pl. III, fig. 2).

One specimen (200 mm.) from Phungin Hka: '*Nga Lai*'.
One specimen (198 mm.) from Sinan Hka: '*Ulai*'.
One specimen (192 mm.) from Phungin Hka: '*Nga Jan*'.
One specimen (114 mm.) from Sinan Hka: '*Janri*'.
One specimen (42 mm.) from Phungin Hka: '*Ukhang*'.

In 1839, McClelland (41) described and figured the species under the name '*Cyprinus dyocheilus*' from "the clear active currents of the Bramaputra from Middle Assam to the rapids at the extremity of the valley". He further remarked that the fish "appears to be equally unknown (*sic*) in the mountain torrents and sluggish rivers and jeels of the plains". Unfortunately, both the description and the figure of the species given by McClelland are inadequate for determining the exact identity of the fish. Day, in his *Fishes of India* and *Fauna* volume gave rather a general account of the fish, but this and his figure (pl. cxxx, fig. 1) are inadequate for determining the species. According to him *L. dyocheilus* is distributed in the "Sind Hills and along the Himalayas to Sikkim and Assam" (14).

In the collection of the Indian Museum there are only three specimens labelled as *Labeo dyocheilus*, two of which were purchased from Dr. Francis Day, while the third one is a skin of a medium-sized specimen procured by Dr. S. W. Kemp from Yembung (1100 ft.) in the Abor Country in Assam (8). One of Day's specimens comes from Hardwar (No. 1522), and the other from Simla (No. 1533), and they are about 12.6 cm. and 32 cm. in length respectively. These two specimens from the Western Himalayas do not appear to me to represent the true *L. dyocheilus* so far as I am able to judge by comparison with the Abor specimen, which I consider to be the typical form of *L. dyocheilus*. It seems probable that the Western Himalayan form of the species is distinct from the one distributed along the Eastern Himalayas; but in the absence of adequate materials from both of these areas no definite decision on this point can be reached.

Recently, Messrs. G. E. Shaw and E. O. Shebbeare have collected a number of specimens from the rivers near Siliguri at the base of the Darjiling Himalayas and have presented a few of them to the Indian Museum. After a detailed study of all these specimens and comparing them with the Abor specimen, both Dr. S. L. Hora and I referred them to the typical form of *L. dyocheilus*.

In the collections of fishes from the Mali Hka system under report there are 5 well-preserved specimens, as detailed above.

These Burmese examples, although referable to *L. dyocheilus*, differ from it to some extent in lepidosis, colouration, etc.

During the preparation of the present account, a similar specimen has been received by Dr. Hora for determination and as donation to the Indian Museum from Dr. H. M. Smith of the Department of Fisheries, Bangkok, Siam. Dr. Smith remarked that the fish "came from the north-western Siam, from a stream at Meh Sord on the Burmese border. It is unlike anything else in our collection". The specimen has, however, been identified as *L. dyocheilus*, and it may be noted that this is the first record of the species from Siamese waters. On re-examination of this Siamese specimen I find that it corresponds entirely to the Burmese form and has the same differences from the Indian individuals. Thus it seems that *L. dyocheilus* is a very variable species, and according to its geographical distribution the species may be divided into the following main groups:

(i) Western Himalayan form.
(ii) Eastern Himalayan and Assamese form, *i.e. forma typica*.
(iii) Burmese and Siamese form.

From the foregoing data it is clear that it is not possible at the present moment to deal with the Western Himalayan form, while detailed accounts of the typical and the Burmo-Siamese form may be given for future reference. Below I have given a description of the *forma typica* of *L. dyocheilus* and the diagnostic features as also figures of the Burmese type.

**Forma typica :**

D. 3/12; A. 3/5; P. 1/17; V. 1/7; C. 19 (excluding the small compact outer rays); L. l. 40-44; L. tr. 16-17 ($9\frac{1}{2}$-$10\frac{1}{2}$/$6\frac{1}{2}$-$7\frac{1}{2}$).

The head and the body are laterally flattened. The head is rather small and narrow, and covered with a thick integument. It is much longer than it is broad and deep, the length being contained about 4.5 times in the total length of the body without the caudal fin. It is considerably higher than broad, the breadth being almost equal to its length behind the anterior margin of the eyes. The snout is very prominent, muscular, and more or less pointed anteriorly. In some specimens, there is a distinct depression across it. A fairly deep lateral furrow is present on either side of the snout in all the specimens. The length of the snout is contained from 2.5 to about 3 times in the length of the head. It is provided all over with a series of fairly large open pores. A pendulous rostral fold is present. The eyes are rather small, have a free orbital margin, and are situated much nearer the angle of the operculum than the tip of the snout. The orbital width is contained from 4.5 to about 5 times in the length of the head,

and almost 2 times in the length of the snout. The interorbital space is wide and slightly convex. It is nearly twice as broad as the orbital width. The nostrils are situated much nearer to the anterior margin of the orbit than to the tip of the snout.

The mouth is horse-shoe-shaped and sub-inferior. Its opening is wide, the cleft extending nearly to the level of the anterior margin of the eyes. Both the lips are continuous and more or less fleshy. There is a distinct post-labial fold, deep-set in the post-labial groove. The upper lip is protrusible and it partly overhangs the vestibulum of the mouth. The lower lip is widely separated in the middle and reflected from the lower jaw. Internally, it is covered with series of stumpy papillae. A pair of maxillary barbels, which are usually shorter than the diameter of the eyes, are situated at the angle of the post-labial fold. Both the jaws have an inner horny covering.

All the fins are well developed. The insertion of the dorsal fin is considerably nearer the tip of the snout than the base of the caudal fin. It is equidistant from the tip of the snout and the origin of the anal fin; in some cases it is much nearer the former. It is as high as or slightly less than the depth of the body below it. Its outer margin is concave. The pectorals are shorter than the head and are separated from the commencement of the ventrals by a distance equalling nearly half their own length. The ventral fins are slightly shorter than the pectorals and are separated from the insertion of the anal by a distance equalling almost half their own length. The anal fin is nearly as long as the ventrals, and when adpressed just reaches the base of the caudal fin or misses it by only a very short distance. It has a slightly concave margin. The caudal fin is much longer than the head and its own height. It is deeply furcate, the upper lobe in some grown-up specimens being slightly longer than the lower. All the rays of the dorsal, anal, pectoral and ventral fins have thin fleshy lateral lappets which are characteristic of most of the Cyprinoid fishes that inhabit the mountainous streams and rivers.

The scales are of moderate size and are arranged regularly on the body. There are from 40 to 44 scales along the lateral line and from 16 to 17 rows between the bases of the dorsal and the ventral fins. Between the base of the dorsal and the insertion of the lateral line there are from $9\frac{1}{2}$ to $10\frac{1}{2}$ rows, while between the lateral line and the base of the ventrals there are from $6\frac{1}{2}$ to $7\frac{1}{2}$ rows. The predorsal scales vary from 17 to 19. Around the caudal peduncle there are from 22 to 23 scales. The scales on the chest are considerably reduced in size. The bases of the dorsal, anal and the caudal fins are more or less scaly. The scaly appendages of the ventral fins are well-developed.

McClelland (41) has described the colouration of the fish as "bluish or brownish black above and on the extremities of the fins, but bluish-white along the belly; the sides are also bluish-white with various stains of red and yellow on the shoulder", while according to Day (14) it is "of a dull green, darkest above; fins darkest in the centre". It appears that both McClelland's and

Day's notes on colouration of *L. dyocheilus* were made on fresh specimens. In specimens, ordinarily treated and preserved in alcohol, the colouration is from a uniform reddish to greenish-brown above and paler below. There appears to be a faint blackish patch on the 4th and 5th scale of the lateral line.

**Burmese and Siamese form :**

In some of the Burmese and Siamese individuals of *Labeo dyocheilus* the head may be slightly shorter than that in the typical form, and the length of the head may be contained about 5 times in the length of the body without the caudal fin. The snout is rather bluntly rounded anteriorly. The depression across the snout is very well-marked. The dorsal fin is variable in height and may be as high as, slightly more or a little less than the depth of the body below it. The pectoral fins are usually shorter than the head; but it seems that in well-grown individuals they may be a little longer. In the Siamese individual from Meh Sord, which is 222 mm. without the caudal fin, the pectorals are longer than the head.

There are from 40 to 41 scales along the lateral line and 13 rows in a transverse series. Between the base of the dorsal fin and the insertion of the lateral line there are $7\frac{1}{2}$ rows of scales, while between the lateral line and the base of the ventrals $5\frac{1}{2}$ rows. Before the dorsal there are about 18 scales, while the scales round the caudal peduncle vary from 19 to 21.

The colouration in alcohol is dark brownish above and yellowish to white below. A fairly large faint blackish precaudal blotch seems to be characteristic of the Burmese and the Siamese forms. A narrow blackish patch on the 4th and the 5th scales of the lateral line is also to be found in some individuals. All the fins are dusky. The central rays of the caudal fin are blackish. In the Siamese specimen traces of fine series of dusky longitudinal lines are discernible on each side of the body. Each scale has a faint reddish dot in the centre.

*Remarks*: *Labeo dyocheilus* is a very variable and widely distributed species. It is known to occur in Northern Bengal, Assam, Burma, along the Eastern Himalayas and in north-western Siam. Day's specimens from Hardwar and Simla, mentioned above, do not seem to represent this species, but any conclusive remarks on the so-called *L. dyocheilus* of the Western Himalayas, are, however, impossible till adequate material from these areas becomes available for further study.

The species is said to be common in Assam; and is known by the local name '*Gorea*'. According to McClelland its "usual size is from one to two and a half feet in length, and though sometimes coarse, its flesh is always well flavoured". Colonel Burton has noted that in the Mali river system in Upper Burma the fish grows "upto 4 lbs."

*Measurements in millimetres:*

| | North Bengal. | Mali Hka System. | | | Siam |
|---|---|---|---|---|---|
| Length of body without caudal ... | 205·0 | 198·0 | 192·0 | 114·0 | 222·0 |
| Height of body ... ... | 55·0 | 56·0 | 49·0 | 31·0 | 62·0 |
| Length of head ... ... | 44·0 | 43·0 | 40·0 | 24·0 | 46·0 |
| Breadth of head ... ... | 27·5 | 26·0 | 21·0 | 15·0 | 28·0 |
| Depth of head .. ... | 34·5 | 34·0 | 29·5 | 19·0 | 39·0 |
| Length of snout ... ... | 16·0 | 15·0 | 14·0 | 8·5 | 17·0 |
| Diameter of eye ... ... | 9·0 | 8·5 | 7·5 | 5·5 | 9·0 |
| Interorbital width ... .. | 14·5 | 14·0 | 14·0 | 8·5 | 16·5 |
| Height of dorsal fin ... ... | 55·0 | 52·0 | 46·0 | 25·0 | 70·0 |
| Length of pectoral fin ... | 43·0 | 40·0 | 35·0 | 20·0 | 48·5 |
| Length of ventral fin ... .. | 41·0 | 37·0 | 32·5 | 19·5 | 45·0 |
| Length of anal fin ... ... | 41·0 | 36·5 | 35·0 | 19·0 | 47·0 |
| Length of caudal fin ... ... | 58·0 | ... | ... | ... | 50·0 |
| Length of caudal peduncle ... | 38·0 | 38·0 | 35·0 | 23·0 | 45·0 |
| Least height of caudal peduncle ... | 27·0 | 24·5 | 23·5 | 13·5 | 28·5 |

**Barbus compressus** Day.

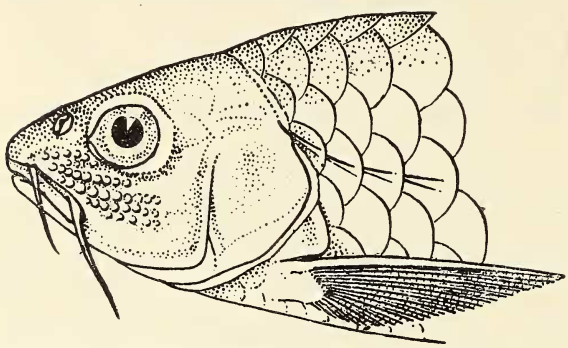
(Pl. I, Fig. 6).

One specimen (122 mm.) from Tang Hka: *'Urat'*.

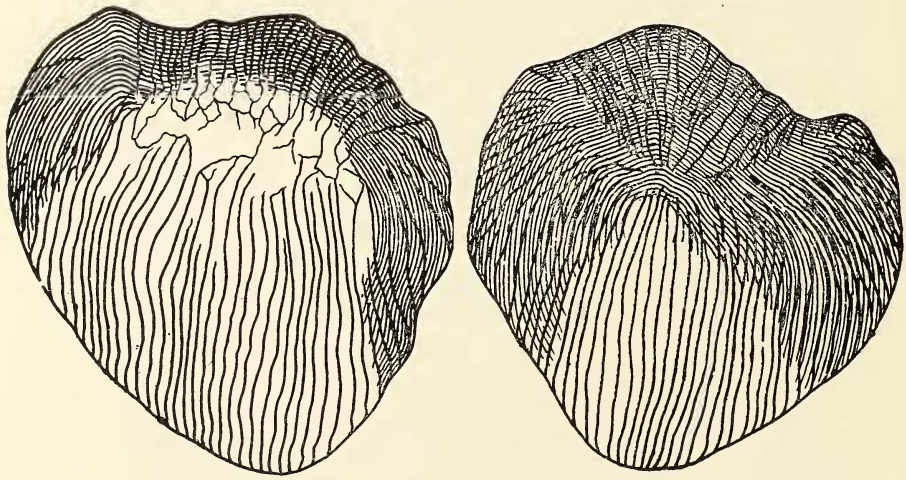
In 1869, Day (10) described the species from a single specimen, the precise locality of which was not known. He remarked: "The native country of the type-specimen is uncertain, but the fish was found in a bottle in the Calcutta Museum with an *Oreinus* from Cashmere. It is a fine specimen in excellent preservation". Unfortunately, since Day's discovery of the species further material was not available to clear up the doubt in regard to the *provenance* of this interesting fish and consequently little or no attention has been paid to the species. In the collection of the Indian Museum the unique type-specimen of *B. compressus* is preserved in the original bottle. The specimen has not undergone any marked

deterioration through preservation in alcohol for a period of sixty-four years, except for the colouration which is completely lost.

In the collection of fishes from the Mali Hka system there is a fine specimen which agrees in all essential characters with the type-specimen of *B. compressus* of Day, and I have not the least hesitation in assigning the fish to this species. In view of the fact that *B. compressus* stands rather on an inadequate description based on a single specimen and that the fish has not been figured so far, I take this opportunity to give a detailed description of the species based on a comparative study of both the type-specimen and the Mali river example and to publish an illustration of the latter. To facilitate comparison, a



Text-fig. 8.—Lateral view of the anterior portion of the head and body of the type-specimen of *Barbus compressus* Day showing the characters of the eyes, mouth, the lips and the barbels etc., ×1½.



*a* *b*

Text-fig. 9.—*a*. Scale from the base of the dorsal fin of the type-specimen of *Barbus compressus* Day, ×6.

*b*. Scale from the base of the dorsal fin of *Barbus compressus* Day from the Mali Hka system, ×6.

figure of the anterior portion of the type-specimen, showing the characters of the head and eyes, etc. is also added (Text-fig. 8). Characters of scales have often been considered to be of specific value among Cyprinoid fishes. I have, therefore, given camera lucida drawings of the scales of the two specimens under report.

The scales are taken from below the base of the dorsal fins (Text-fig. 9, *a* & *b*). It is clear from the structure of these scales that they are more or less similar except for some minor differences which are almost certainly due to a difference in the age of the two specimens.

D. 4/8; A. 3/5; P. 1/14; V. 2/8; C. 26 (excluding the small compact outer rays); L. l. 25-26; L. tr. 7 ($4\frac{1}{2}/2\frac{1}{2}$).

The dorsal outline ascends gradually from the tip of the snout to the nape where it falls slightly and then rises up again to the origin of the dorsal fin. Beyond this point the outline slopes down rather abruptly and converges to the base of the caudal fin. The ventral outline is feebly convex throughout.

The head is conical, considerably compressed; and its length is contained nearly 4 times in the length of the body excluding the caudal fin. It is higher than wide, the maximum height being equal to the length of the head without the snout, while the width is equal to the length of the head behind the middle of the eyes. The snout is obtusely pointed and almost as long as the diameter of the eyes. The eyes are of moderate size and situated in advance of the middle of the head. Their diameter is contained nearly 4 times in the length of the head. The interorbital region is somewhat convex and its width is nearly equal to or slightly less than the diameter of the eyes. There are 5 to 6 transverse series of well developed conical tubercles on the anterior portion of the cheeks. On the snout there are no pores. The lips are thick and fleshy. The upper jaw is slightly longer than the lower one and is protrusible. Two pairs of barbels are present. The maxillary barbels are slightly longer than the diameter of the eyes. The rostrals are shorter than the maxillaries.

The dorsal fin is situated much nearer to the tip of the snout than to the base of the caudal fin. The insertion is vertically above the posterior margin of the 7th scale of the lateral line. The last undivided dorsal ray is fairly strong and smooth posteriorly. The height of the dorsal fin is as long as the head behind the opening of the nostrils. Its outer margin is slightly concave. The pectorals are as long as the head excluding the snout, and are separated from the insertion of the ventrals by a distance equalling about $\frac{1}{3}$ their own length. The ventrals are considerably shorter than the pectorals and are separated from the origin of the anal by $\frac{1}{2}$ their own length. The anal fin is rather short and extends to the middle of the caudal peduncle. Its outer margin is similar to that of the dorsal. The caudal fin is longer than high, the length being slightly more than the length of the head without the snout.

The scales are large and arranged regularly. There are 9 scales before the dorsal fin and 10-11 round the caudal peduncle. The bases of the dorsal and the caudal fins are scaly. The scaly appendages of the ventrals are fairly well developed.

The colouration of the type specimen has been described by Day as "silvery, fins stained darker". But, as already mentioned, the original colour of the specimen is totally lost. It is now

uniformly brownish with a faint golden sheen. The specimen from the Tang Hka is dusky all over the body above the lateral line and pale yellowish below. A fairly large black ocellus is present at the base of the caudal fin. Each scale is marked with a small dusky spot at the base. All the fins are dusky.

According to Colonel Burton's notes the fish is said to grow "up to 4 lbs.".

*Remarks*: From a careful examination and a thorough comparison of the two specimens under report I am convinced that the Burmese example is indistinguishable from the type-specimen of *B. compressus* Day. It is impossible, however, to come to any definite conclusion in regard to the type-locality and the distribution of the species even in the light of the present discovery of the species from Burma. For, on the one hand, its distribution may be sporadic in Kashmir and in Burma, while on the other, the fish may be an endemic Burmese form. Considering the very specialised nature of the fish-fauna of Kashmir, the former does not seem to me to be very probable, while in the event of the latter being true, which I am more inclined to believe, it is self-evident that, through inadvertence, the type specimen of *B. compressus* had been put in the same bottle with an *Oreinus* from Kashmir.

*Measurements in millimetres*:

| | Type specimen | Burmese specimen |
|---|---|---|
| Length of body without caudal | 155·0 | 122·0 |
| Height of body | 40·0 | 34·0 |
| Length of head | 38·0 | 31·0 |
| Breadth of head | 23·0 | 18·0 |
| Height of head | 27·5 | 22·0 |
| Length of snout | 11·5 | 10·0 |
| Diameter of eye | 10·0 | 8·5 |
| Interorbital width | 9·5 | 7·5 |
| Height of dorsal fin | 34·0 | 26·0 |
| Height of last undivided dorsal ray | 34·0 | 26·0 |
| Length of anal fin | 27·5 | 20·0 |
| Length of pectoral fin | 32·0 | 24·5 |
| Length of ventral fin | 26·0 | 18·5 |
| Length of caudal fin | (Broken) | 24·0 |
| Length of caudal peduncle | 30·0 | 20·0 |
| Least height of caudal peduncle | 18·5 | 13·5 |

**Barbus tor** (Ham. Buch.) *sensu lato.*

One specimen (190 mm.) from Phungin Hka: *'Shabyin Ningshaw'.*
One specimen (134 mm.) from Phungin Hka: *'Nga Rat'.*
One specimen (132 mm.) from Tang Hka: *'Shamyin Ningshaw'.*
One specimen (64 mm.) from Phungin Hka: *Hkauka La'.*

In a recent paper Deraniyagala (17) has revived the genus *Tor* Gray (1833) of which *'Cyprinus tor'* of Hamilton Buchanan is the type. In the *Genera of Fishes*, Jordan (39) remarked that *Tor* Gray "replaces *Labeobarbus* Bleeker" (p. 139), while about *Labeobarbus* Rüppell (1836) he opined that the genus is "probably not distinct from *Tor* Gray" (p. 186). In the absence of any definite data in regard to the specific limit of Buchanan's (20) *C. tor* which he obtained from the Mahananda River in Northern Bengal, I am unable to agree with Deraniyagala's contention about using the name *Tor* for the species in preference to *Barbus* of Cuvier (1817) of which, *Labeobarbus* and certain other so-called allied genera have by most authors been considered synonyms. In this connection Günther's (19) useful remarks may be quoted. He observed: "Many attempts have been made to divide the Barbels into generic groups, as may be seen from the synonymy. And, indeed, when we consider the great number of species, and the great apparent diversity between the first and the last of the series, a further division must appear to be highly desirable. Yet nothing would be more contrary to the idea of natural genera, the transition from one extreme species to the other being perfect; and those attempts at generic subdivisions prove that the naturalists who proposed them had only a partial acquaintance with the species. The size of the scales, the development of the third dorsal ray, the form of the snout (and consequently of the preorbital) are perfectly useless as generic characters, in consequence of the complete series of intermediate forms. The lips are subject to variation in the same species: thus, for instance, some specimens of *B. bynni* would belong to *Barbus*, others to *Labeobarbus*" (p. 84).

This remark applies equally truly in the case of the genus *Tor* and the species *B. tor*. It is a well-known fact that great confusion centres round the true systematic position of *B. tor*, which is due entirely to the extreme variability of certain differential characters that are ascribed to the species, *viz.*, the length of the head and its proportion to the length of the body, the shape and size of the snout, the nature of the lips, the mesial lobe and the lepidosis, etc. All these features have frequently been found to vary so much in *B. tor* that they almost entirely overlap the distinguishing characters of the so-called allied genera and of the related species. Under these circumstances, I am of opinion that it is futile to recognise the genus *Tor* for such fishes as are widely variable in those very characters on which the genus is based, and that *B. tor* should be regarded as a composite and variable species of *Barbus* until it is possible to understand and define properly the specific limits of Hamilton Buchanan's *'Cyprinus tor'*.

The specimens under report from the Mali Hka system have

the dorsal fin rays stained with black. Series of black marks are present in the centre and on the posterior edge of the scales. The pigmentation is more prominent in the upper half of the body than in the lower.

It has been noted in the field-notes of Colonel Burton that the species grows "up to 60 lbs." The fish, however, has been known in Burma to grow to a much larger size, weighing over 90 lbs.[1]

**Barbus clavatus burtoni,** subsp. nov.

(Pl. III, Fig. 1).

Three specimens (162, 130 and 110 mm.) from Phungin Hka: '*Nga Ju*'.
One specimen (83 mm.) from Tang Hka: '*Nga Ju Chang*'.
One specimen (80 mm.) from Sinan Hka: '*Nga Ju*'.
One specimen (74 mm.) from Tang Hka: '*Nga Ju Hpraw*'.

In 1921, Hora (23) discussed at some length the affinities of *Barbus clavatus* McClelland with its allies and published a description and a figure of the species from several fresh specimens collected by him from the Senapati stream near Kairong in the Naga Hills in Assam. *B. clavatus* has hitherto been found in rivers at the foot of the Sikkim mountains on the northern frontier of Bengal and in the Naga Hills in Assam. Among the fishes of the Mali river system of the Myitkyina District under report, there are 6 well-preserved specimens, as detailed above, which, though very closely related to *B. clavatus*, differ from it in certain characters by which they may be allotted to a separate group. Besides these specimens from the tributaries of the Mali Hka, I have also examined a similar, but much larger specimen (172 mm.) collected by Mr. A. Macdonald from Sahmaw in the Myitkyina District and sent by the Curator of the Bombay Natural History Society to Dr. S. L. Hora for study, in March, 1926. On referring the matter to Dr. Hora and looking through the correspondence, I gather that, from an examination of the specimen in question, Dr. Hora came to a provisional conclusion that it represented a new form from Burma, He also had drawings made of this unique specimen with a view to publish an illustrated account of the fish in the Bombay Natural History Society's Journal as soon as a few more specimens of this interesting fish were available from the same locality for testing the adequacy of the description. But no more examples were obtained and the Sahmaw-fish, therefore, remained undescribed. Having before me a fine series of the same fish in Colonel Burton's collections from the same district of the northern frontier of Burma, it is now possible to judge of the affinities of the fish and to publish its description with figures. I am in agreement with Dr. Hora's original views about the form being new to science and I refer the specimen from Sahmaw, as well as the ones from the Mali Hka system, to a new subspecies of *B. clavatus*. I have the greatest pleasure in associ-

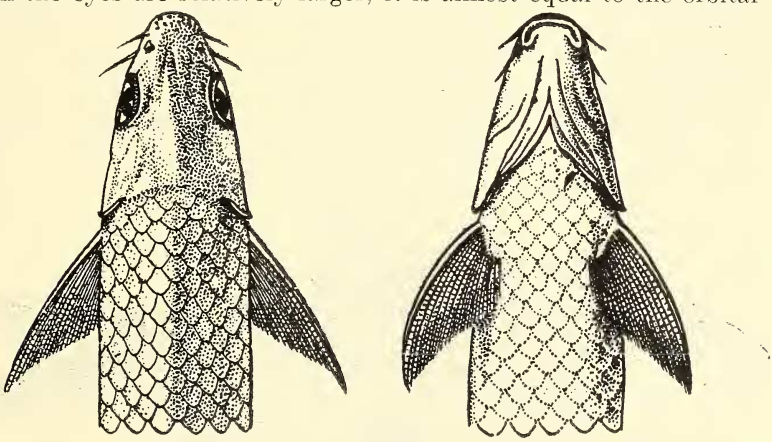
[1] Hertz, W. A., *Burma Gazetteer, Myitkyina District*, p. 17 (Rangoon, 1912).

ating the new form with the name of Lt.-Col. R. W. Burton. The fish may be characterised as follows:

D. 4/8; A. 3/6; P. 1/16; V. 1/8; C. 19 (excluding the small compact outer rays); L.l. 35-38; L. tr. 10. ($6\frac{1}{2}/3\frac{1}{2}$).

*Barbus clavatus burtoni* differs from the typical form chiefly in size, lepidosis, certain body proportions, colouration, etc. It seems to represent a much larger form than *B. clavatus*, as I find from an examination of the specimens of the latter form from the Senapati stream referred to above as well as two others collected by Dr. Murray Stuart from the Loglai and the Taron rivers in the Naga Hills. All these specimens from Assam are from 45 to 120 mm. in total length without the caudal fin, and some of them about 70 mm. in the minimum and 120 mm. in the maximum are gravid females, whereas the largest female specimen of *B. clavatus burtoni* from the Myitkyina District is 172 mm. long.

The head is short and conical and its length is contained from almost 4 to 5 times in the total length of the body without the caudal fin. It is proportionately longer in young specimens than in adults. The snout is obtusely pointed and is longer than the diameter of the eyes in adult individuals, while in young forms, in which the eyes are relatively larger, it is almost equal to the orbital



*a* *b*

Text-fig. 10.—*a*. Dorsal view of the anterior portion of the head and body of *Barbus clavatus burtoni*, subsp. nov., ×*ca.* $\frac{2}{3}$.
*b*. Ventral view of the same, × *ca.* $\frac{2}{3}$.

width. Its length is contained from 3 to 3.3 times in the length of the head. It is provided with 2 or 3 rows of horny tubercles, which are less pronounced in immature stages. The eyes are fairly large and are situated nearer the tip of the snout than the free margin of the operculum. Their diameter is contained from 3.3 to about 4 times in the length of the head. The interorbital space is convex and greater than, or almost equal to the orbital width according as the fish is grown up or young.

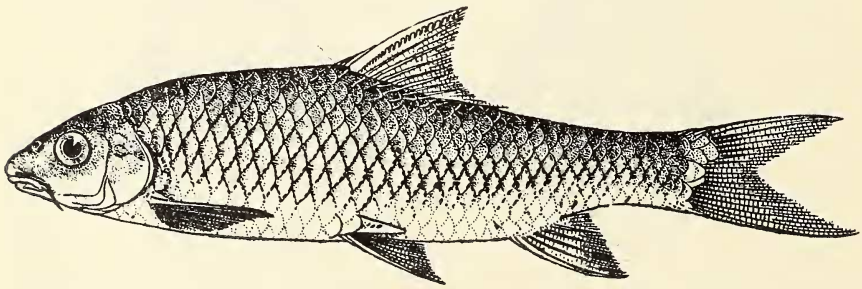
The mouth is horse-shoe-shaped and sub-inferior. The cleft of the mouth extends nearly to the level of the anterior margin

of the orbit. Both the lips are fleshy and continuous, the upper one partly overhanging the lower, which is widely interrupted in the middle. A fleshy pendulous rostral fold is present. There are two pairs of barbels, which are of nearly equal length. They are as long as the diameter of the eyes or slightly longer.

The dorsal fin is inserted almost in the middle of the distance between the tip of the snout and the base of the caudal fin, or slightly nearer the former than the latter. It is of considerable height, but its last osseous spine which is sharply denticulated posteriorly, is not so high as the depth of the body below it. Its outer margin is deeply concave. The pectorals are shorter than the head, but longer than the ventrals. The anal fin is rather short and has more or less a straight outer margin. The caudal fin is deeply forked and usually longer than the head and its own height. In some grown-up specimens the upper lobe is a little longer than the lower. The caudal peduncle is considerably longer than high, specially in adult individuals.

The scales are fairly large and arranged regularly. There are from 35 to 38 scales along the lateral line, and 10 rows between the bases of the dorsal and the ventral fins. Between the base of the dorsal and the lateral line there are $6\frac{1}{2}$ scales, while $3\frac{1}{2}$ between the lateral line and the ventrals. The predorsal scales vary from 12 to 14. The scaly appendages of the ventrals are fairly enlarged. In some large-sized specimens a couple of rows of scales at the base of the caudal fin are considerably enlarged as is seen in the specimen from Sahmaw.[1]

Colouration in alcohol is dark bluish-black or brownish above and pale white below the lateral line. Along the lateral line on either



Text-fig. 11.—Lateral view of a specimen of *Barbus clavatus burtoni*, subsp. nov. from Sahmaw in Upper Burma showing colour variation, × *ca.* $\frac{1}{2}$.

side is present a more or less complete and distinct band in some specimens, while in others, as in the Sahmaw specimen, the free margins of a few longitudinal rows of scales are dotted with fine blackish pigment forming a meshy design (Text-fig. 11). The fins are dusky to whitish. The outer borders of the caudal fin are tipped with black.

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[1] I am indebted to Dr. S. L. Hora for kindly allowing me to publish his manuscript drawing of the Sahmaw-specimen.

*Remarks*: *B. clavatus burtoni* may be easily distinguished from the typical form by its longer snout, shorter third spine of the dorsal fin, fewer scales along the lateral line, in a transverse series and before the dorsal fin, and by the colouration which is more dark than bright and silvery. According to Colonel Burton's field-notes, the fish grows "up to 7 lbs."

*Distribution*: Tributaries of the Mali Hka and Sahmaw in the Myitkyina District of Northern Burma.

*Type-specimen*: No. F. $\frac{11437}{1}$ preserved in the collections of the Zoological Survey of India, Indian Museum, Calcutta.

*Measurements in millimetres*:

| | Sahmaw | Mali Hka system | | |
|---|---|---|---|---|
| Length of body without caudal ... | 172·0 | 162·0 | 110·0 | 83·0 |
| Height of body ... ... ... | 42·0 | 41·0 | 30·0 | 25·0 |
| Length of head ... ... ... | 35·0 | 35·0 | 26·0 | 20·0 |
| Breadth of head ... ... ... | 23·0 | 21·0 | 14·0 | 11·5 |
| Depth of head ... ... ... | 28·0 | 27·0 | 19·0 | 15·0 |
| Length of snout ... ... ... | 11·5 | 11·0 | 8·0 | 6·0 |
| Diameter of eye ... ... ... | 8·5 | 9·0 | 7·5 | 6·0 |
| Interorbital width ... ... | 10·5 | 10·5 | 8·0 | 5·0 |
| Height of dorsal fin ... ... | 32·0 | 36·0 | 25·0 | 18·0 |
| Length of pectoral fin ... ... | 30·0 | 32·0 | 21·0 | 15·0 |
| Length of ventral fin ... ... | 26·0 | 29·0 | 19·0 | 13·0 |
| Length of anal fin ... ... | 28·0 | 25·0 | 18·0 | 11·5 |
| Length of caudal fin ... ... | 44·0 | 38·0 | 30·0 | 23·0 |
| Length of caudal peduncle ... ... | 29·0 | 30·0 | 22·0 | 15·0 |
| Least height of caudal peduncle ... | 16·0 | 18·0 | 12·0 | 10.0 |

## **Barbus chagunio** (Ham. Buch.).

One specimen (125 mm.) from Phungin Hka: *'Chyet neug'*.

The occurrence of this species in the Burmese waters was unknown till its recent report from the Myitkyina District in Upper Burma by Prashad and Mukerji (45). The specimen under report agrees perfectly with the description of the Burmese specimens given by these authors.

There had been a certain amount of confusion in regard to the specific validity of *B. chagunio*, and the matter was discussed in detail by Hora (32). The relationship of the species *B. chagunio*

with *B. spilopholus* of McClelland had also been a matter of dispute. Quite recently it has been shown by Hora and Mukerji (38) that *B. spilopholus* is conspecific with *B. chagunio*. The species is sexually dimorphic. *B. spilopholus* with the prolonged anal rays and well developed tuberculated pads on the snout and the cheeks represents a male, while *B. chagunio* without such characters is a female.

The specimen from the Phungin Hka is a female. It has no definite pores or tubercles on the snout and the cheeks, nor the elongated anal rays.

According to Colonel Burton's notes the fish is said to grow "up to 2 lbs."

**Barbus chola** (Ham. Buch.).

One specimen (90 mm.) from Phungin Hka: '*Shalum shawng*'.

A very faint blackish mark is present in the middle of the caudal peduncle. Another deep black blotch behind the gill opening is characteristic of the Burmese specimens. The dorsal fin has a black mark along the anterior part of its base and another along the centre. Posteriorly the scales have a dusky spot.

**Barbus sarana caudimarginatus** Blyth.

One specimen (154 mm.) from Phungin Hka: '*Nga pawk*'.
One specimen (150 mm.) from Phungin Hka: '*Nga bupawk*'.
One specimen (180 mm.) from Phungin Hka: '*Nga tawt*'.

The three specimens, although they have different local names, are all referable to this species. According to Colonel Burton's field-notes '*Nga bupawk*' grows "up to ½ lb.", while '*Nga pawk*' and '*Nga tawt*' grow in weight "up to 2 lbs.", and "4 lbs.", respectively. Since all the specimens represent a single species, these weights must refer to different sizes and, presumably, ages of the fish.

The barbels are blackish dorsally and whitish below. Both the dorsal and the caudal fins are tipped with black. There are very fine blackish longitudinal lines along the sides.

**Semiplotus semiplotus** (McClell.).

One specimen (44 mm.) from Phungin Hka: '*Salep la*'.
One specimen (67 mm.) from Sinan Hka: '*Salep la*'.
One specimen (90 mm.) rom Phungin Hka: '*Shalum shawng*'.
One specimen (115 mm.) from Tang Hka: '*Udi*'.
One specimen (150 mm.) from Phungin Hka: '*Wudi*'.

According to Colonel Burton's field-notes, in young stages the species is locally believed to represent a "small variety" and known as '*Salep la*'; but when the fish grows to a weight from "4 lbs. to 7 lbs." it is known by the name '*Udi*' or '*Wudi*'.

In all the specimens under report there are from 9 to 12 pores on either side of the snout. The last undivided dorsal ray is slightly longer or shorter than the length of the head according as the specimen is grown-up or young. The same is true in regard to the length of the pectoral fins.

GENUS : **Rohtee** Sykes.

Most of the earlier ichthyologists adopted the name *Osteobrama* Heckel in preference to *Rohtee* Sykes. Hora (23) has already discussed the matter and has pointed out that Sykes' work (51) was published in 1841, while Heckel established his genus *Osteobrama* in 1843, and that according to the International Rules of Zoological Nomenclature Sykes' genus *Rohtee* has priority over *Osteobrama* of Heckel.

Recently, Tchang (52) has established a genus allied to *Rohtee* (=*Osteobrama*) which he calls *Parosteobrama* to accommodate two specimens of his *P. pelligrini* collected from 'Se-tchuan' (Szechuan) in China. He has defined the genus as follows:

"Corps comprimé; bouche termnale et verticale lèvres cornées; linge latérale plus rapprochée du ventre que du dos; dents pharyngiennes sur 3 rangées; vessie natatoire en 3 parties; dorsale débutant plus près de la caudale que du bout du museau, son troisième rayon simple ossifié, mais sans denticulations; anal longue; abdomen tranchant.

Ce genre est voisin de *Osteobrama* Heckel (*Rohtee* Sykes); il s'en distingue par ses lèvres cornées et par la vessie natatoire en 3 parties."

From the generic definition of *Parosteobrama* as well as from the illustrated description of the species, *P. pelligrini* I find that Tchang has considered the horny jaws and the tri-chambered air-bladder to be the chief distinguishing features.

In certain species of the genus *Rohtee* there is an indication of horny pads on the jaws, and in *Parosteobrama* this condition is probably accentuated.[1]

In my opinion, therefore, the horny covering on the jaws in fishes should, in most cases, be correlated with the environmental conditions of the fish and considered as an adaptive modification, which must vary in accordance with the necessity and the degree of adaptability.

In regard to the three-chambered air-bladder, Tchang observes "vessie natatoire en 3 parties, la premiere, ovale et arrondie aux deux bouts, la deuxieme plus longue que la premiere, la troisieme tres petite". Unfortunately, the author has not published any

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[1] Since this report went to the press, Messrs. H. W. Wu and K. F. Wang's interesting paper—'Preliminary note on the lips of *Parabramis terminalis* (Richardson)'—published in *Contrib. Biol. Lab. Sci. Soc., China*, viii, *Zool. Ser.*, No. 10 (1932) has become available. In dealing with the structure of the epidermis of the lips of *Parabramis terminalis*, which are 'more or less horny in appearance' in specimens preserved in formalin or alcohol, the authors point out 'Tchang recognizes the particular structure as a horny lip (levres cornées) as a characteristic to his new genus in describing *Parostcobrama pelligrini* which is exactly synonymous of the present species. The so-called horny lip which is considered as a characteristic of the genus *Parosteobrama* is merely the highly developed epidermis of the skin covering the surface of upper and lower jaws, and the outer layers of epithelial cells have to become flattened and more or less cornified.'

This corroborates my view regarding the stability of the structure of the lips in *Parosteobrama* and the inference in respect of the validity of the genus

illustration of this organ, which in view of its having an additional small third chamber is very interesting. As is well known, in most of the Cyprinoid fishes the air-bladder is bi-chambered. If, therefore, the tri-lobed air-bladder of *P. pelligrini* is proved by the future researches to be a constant feature, the fish will have a claim to a genus to itself. At this stage, however, this character cannot be stressed, inasmuch as the conclusion arrived at by Tchang is based on insufficient data. Moreover, the structure of the air-bladder, although considered to be of taxonomic value, has been known to vary considerably in many Cyprinoid fishes. Hora (24), who studied at some length the structures of the swim-bladder in certain Indian fishes, and specially of the various species of the genus *Garra*, found so much structural variation of this organ that he "was almost tempted to regard it as a specific character; but further examination showed that it is not only variable in the different species of the genus (*Garra*) but differs in individuals of the same species as well". I have examined the air-bladder of *Rohtee vigorsii*, the type-species of the genus, and also of *R. duvaucelii* and *R. feae* from Burma. In all these species I have found that there are only two chambers. The anterior chamber is medium-sized and more or less oval in outline, while the posterior one is fairly large and bean-shaped. The chambers are connected together by a narrow duct at a constriction whence the pneumatic duct arises (Text-fig. 12). The aforesaid three species, as also the rest of the species of the genus *Rohtee*, are not so well represented in the collection of the Indian Museum as to allow many specimens to be dissected, and it is, therefore not possible for me to judge the nature and range of variation of this structure in *Rohtee*, and to throw light on that of *Parosteobrama*.

Text-fig. 12.—Air-bladder of *Rohtee duvaucelii* (Cuv. & Val.) from the Myitkyina District, Upper Burma, ×2.

Another feature which Tchang has included in the generic definition of *Parosteobrama* is that the last osseous ray of the dorsal fin is not serrated, while in *Rohtee* it is usually serrated. In this connection reference may be made to a species of *Rohtee*, *R. cumna* (Tickell) Day in which the last osseous ray is simple. The fish was procured and reported by Colonel Tickell from Mandalay in Burma and considered as a valid species by Day. In his *Supplement to the Fishes of India* Day (15) has also re-defined the fish. Vinciguerra (53), however, accepts the validity of this feature in *R. cumna* with reserve and doubts the accuracy of the structure concerned in Tickell's original drawing of the species.

It is thus clear that to be certain about the validity of the genus *Parosteobrama* examination of further material is essential.

If such an examination reveals that the horny covering on the jaws, the tripartite condition of the air-bladder and the smooth nature of the last osseous ray of the dorsal fin are constant characters in a large series of specimens, *Parostcobrama* will then stand on a firmer basis.

### **Rohtee duvaucelii** (Cuv. & Val.).

One specimen (105 mm.) from Phungin Hka: '*Shaping-naw-naw. kpa*'.

A curious confusion has found currency in the ichthyological literature, both earlier and modern, about the use of the specific name of this species. In 1844, Cuvier and Valenciennes described the species for the first time on page 77 of the 17th volume of their *Histoire Naturelle des Poissons* under the denomination "La Breme de Duvaucel: *Leuciscus Duvaucelii*" after the name of M. Alfred Duvaucel who collected the type specimen from "Nepaul". In the index of the same volume which is prefixed to the text, the name "La Breme d'Alfred (*Leuc. Alfredianus* nob)" is printed on page xvi. But the references affixed to this name are made to the description of *L. Duvaucelii* (p. 77) and to a coloured plate of the fish, No. 488 bearing the legend "*Leuciscus Alfredianus* nob". This discrepancy has resulted in the indiscriminate use of both the names, *duvaucelii* and *alfredianus* in the literature. Under the circumstances it is necessary to decide the question of the nomenclatural status of the two names used by Cuvier and Valenciennes for the same fish. So far as I am able to judge, the question of the "Law of Priority" of names or of "page precedence", as embodied in the International Code of the Zoological Nomenclature does not seem to arise here, nor is there any existing code of nomenclature which provides for such a case as that under consideration. In view of this fact the name *duvaucelii* under which the species was described should, in my opinion, have a natural right to exist, while *alfredianus*, a misnomer in all probabilty, should be eliminated from nomenclature.

In 1924 Myers (43) described a new species of *Rohtee*, *R. roeboides* from a single young specimen, 80 mm. excluding the caudal fin. The fish was collected from Monywa on the Chindwin river in Upper Burma. In a letter Dr. G. S. Myers wrote to me: "In working with the Burmese fishes you may have occasion to examine the cyprinoids I described in 1924. I have become dubious of the validity of *Rohtee roeboides* and *Barbus nicholsi*[1] and should welcome any attempt to properly place these fishes." But since in the absence of typical specimens it is not possible to arrive at

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[1] I take this opportunity to point out in passing that Dr. D. Vinciguerra described an African species of *Barbus* under the name '*B. Nicholsi*' (*Ann. Mus. Civ. Stor. Nat. Genova*, LIII, p. 11, 1928). According to the International Rules of Zoological Nomenclature, Art. 35, *B. nicholsi* Vinciguerra (1928) becomes a homonym of *B. nicholsi* Myers (1924). I directed the attention of Dr. Vinciguerra to this point who agreed with me and kindly allowed me the liberty to propose a new name for his species. I have great pleasure in renaming the fish as **B. vinciguerrae.**

any definite conclusion in regard to the validity of these fishes and specially of *R. roeboides*, which concerns me in connection with my present studies, a request was made to Dr. J. T. Nichols of the American Museum of Natural History to send to the Indian Museum the types of these fishes for my examination. In reply Dr. Nichols kindly informed: "I regret that we cannot send you the types of Myers' species for examination, as we are not permitted to send such material outside the country". Thus I have had no chance of examining the type of *R. roeboides*. From Myers' description of the species, however, and after examining a large series of specimens of *R. duvaucelii* of different sizes as well as of the other species of the genus hitherto known from Burma, I have come to a provisional conclusion that *R. roeboides* is strikingly similar, if not identical with *R. duvaucelii*. Myers has already remarked that the species is "related to *Rohtee cotio* (Hamilton Buchanan) and *R. duvaucelii* (Cuvier and Valenciennes)" but "differs from *cotio* and *duvaucelii* in fewer scales (49) and shorter pectorals". It seems that Myers had no specimens of these two species before him for comparison with his species, and that he, therefore, depended considerably on Day's descriptions and figures of these fishes. He pointed out (p. 3 footnote): "Day's figure of *duvaucelii* (*alfrediana*) shows only 45 scales". Unfortunately, Day's descriptions and figures that are given in his *Fishes of India*, though standard references on the subject even today, have often been found to be inadequate and inaccurate for the purpose of understanding the precise limits of the various species; and any conclusion based merely on Day's observations and figures is likely to lead to a mistake.

In an earlier account of the fishes of the Myitkyina District in Upper Burma it has been already pointed out by Prashad and Mukerji (45) that in *R. duvaucelii* the lepidosis is very variable. The number of scales along the lateral line varies from 48 to 52 and there are $9\frac{1}{2}$ to $10\frac{1}{2}$ rows in a transverse series. This conclusion was arrived at after examination of a large series of specimens of the species from various localities. The presence of 49 scales along the lateral line in *R. roeboides*, therefore, does not, *per se*, preclude its assignment to *R. duvaucelii*. In all other respects, as far as I can judge, *R. roeboides* is indistinguishable from *R. duvaucelii*, except for the shorter pectorals. In all the specimens of *R. duvaucelii* that I have examined the pectoral fins either just reach the pelvics or extend slightly beyond them. The length of these fins and their relative proportions, specially in immature stages, can, however, be barely considered to be of specific value.

**Barilius barna** (Ham. Buch.).

One specimen (53 mm.) from Phungin Hka: '*Shapyin*'.
One specimen (65 mm.) from Tang Hka: '*Nyimaungiza*'.
One specimen (76 mm.) from Phungin Hka: '*Shapyin Pyinneu*'.
One specimen (80 mm.) from Tang Hka: '*Shapin*'.
One specimen (100 mm.) from Phungin Hka: '*Nga-chyet-neu*'.

Although the specimens from different localities as well as from the same locality are known by different local names as quoted

above, all undoubtedly belong to *B. barna*. The species is very variable in respect of the presence or absence of barbels, their numbers and the colour pattern, etc. Hamilton Buchanan (20), Günther (19) and Day (14, 16) observe that barbels are entirely absent in *B. barna*. I have examined a large series of specimens of the species from different places in India and Burma and have found that in some only minute maxillary barbels are present, while others are provided with both the maxillary and the rostral pairs. Specially among the specimens of the species from the Siju Cave and the Garo Hills in Assam, I have found many that are provided with one or both the pairs of barbels. Specimens from Burma under report are, however, devoid of barbels excepting the one from the Tang Hka (80 mm.) which has a rudimentary pair of maxillary barbels.

The species seems to be sexually dimorphic so far as it could be ascertained from the nature of the tuberculated structures on the snout, cheeks and on other parts of the body. In males the snout, the jaws, and the lower portion of the cheeks are thickly covered with pointed horny tubercles. In grown-up males 3 or 4 outer branched rays of the pectoral fins have soft cushion-like elevated ridges in the middle, situated dorsally. These pad-like structures are covered with minute tubercles. Some fine tubercles are also present on the last few branched rays of the dorsal fin of some of the males. In all the specimens the lower lobe of the caudal fin is longer than the upper. In Burmese forms this feature appears to be more pronounced than in the Indian individuals.

Broad, black vertical bands at the sides, which vary from 7 to 9, are present in all the specimens. The dorsal fin is edged with black and white, white on the top and black below. In most individuals the scales of the upper portion of the body have a fine blackish outline.

**Barilius barila** (Ham. Buch.).

One specimen (81 mm.) from Phungin Hka: '*Hkumpyi Ulum*'.
One specimen (81 mm.) from Phungin Hka: '*Shapyin*'.
Two specimens (95 and 105 mm.) from Tang Hka: '*Shapin*'.
One specimen (101 mm.) from Sinan Hka: '*Shapyin-Pyinzut*'.

It appears from the local names quoted from the field-notes of Colonel Burton that the fish is known by different names in the same and in different localities. Comparing certain local names of *B. barila* with those of *B. barna* it further appears that in certain localities, at any rate, the Kachins do not recognise them as two distinct species. For instance, both the species are known by the names '*Shapyin*' and '*Shapin*' at Phungin Hka and Tang Hka respectively, although elsewhere they have other local names.

Like the preceding species, *B. barila* is considerably variable in respect of certain characters, and at certain stages of growth the two species are so very similar that it is difficult to differentiate one from the other. In this connection mention may be made of *B. barnoides* described from 'Catchin' in Burma by Vinciguerra (53). I have examined a para-type of the species kindly presented to the Indian Museum by Dr. D. Vinciguerra. A thorough

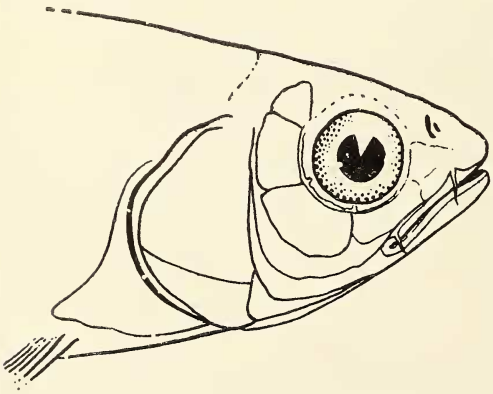
examination of this form and a detailed comparison with its allies has convinced me that *B. barnoides* is conspecific with *B. barila*. I have discussed this matter below under a separate heading.

Both Hamilton Buchanan (20) and Günther (19) have observed that in *B. barila* the barbels are absent, while according to Day (14, 16) "a small rostral pair is present". Of the earlier authors, Day has given undue importance to the nature and the number of the barbels in regard to the systematic classification of the different species of the barbelled Cyprinid genera. He has based his synopsis of the species of the genus *Barilius* on the presence or absence of barbels. But this has been found to be faulty which is due partly to Day's having overlooked the minute tendrils in many species of *Barilius*, and partly to his having been influenced by the *a priori* observations of other authors. Day's synopsis of the species of the genus *Barilius* can, therefore, be hardly rigidly adhered to in the matter of determining the specific identity. I have examined large series of *B. barila* from different localities and have found that in most cases there are two pairs of barbels, while two barbels and no barbels are found only in a few cases. In all the specimens from the Mali Hka system there are two pairs of barbels. The rostrals are nearly twice as long as the maxillary barbels.

The sides and the lower portion of the mandible as also the tip of the snout are covered with minute pores and tubercles. There are 10 to 12 vertical black bands along the sides. The posterior margin of the caudal fin is tipped with black.

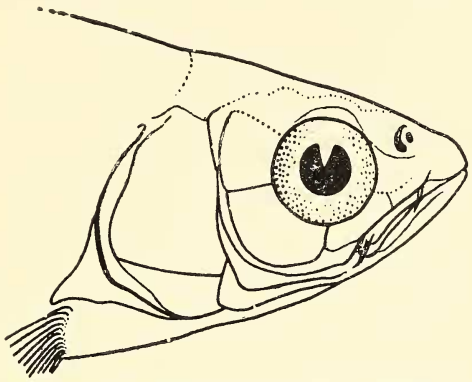
**Remarks on the identity of *Barilius barnoides* Vinciguerra:**

In 1889, Vinciguerra described the species from 'Catchin' in Burma, and characterised it chiefly by the absence of the barbels and the third suborbital bone not being in contact with the pre-opercular ridge. Having carefully examined a para-type of *B. barnoides* and studied the illustrated description of the species, I have come to the conclusion that *B. barnoides* cannot be considered as a valid species distinct from *B. barila*. In Vinciguerra's form, as I find from the para-type, both the rostral and the maxillary barbels are present which were somehow overlooked by the author. The accompanying illustration (Text-fig. 13) of the anterior



Text-fig. 13.—Lateral view of the head of a paratype of *Barilus barnoides* Vincig. showing relative positions of the third suborbital bone and the preopercular ridge, ×2.

portion of the body of the para-type of *B. barnoides* shows these barbels. The only other character that has been used by Vinciguerra in separating his species from *B. barila* is that in the former the third suborbital bone is not in contact with the preopercular ridge, while in the latter it is said to be in contact. I have examined a large series of *B. barila* of different sizes and from different places and have found that the bones under consideration are very variable in shape and size, etc., irrespective of age and locality; and consequently, their relative positions are also variable. In most cases the third suborbital bone does not lie in contact with the preopercular ridge or according to Day (14, 16) it "nearly" touches the latter (Text-fig. 14). Considering the variability in structures and the relative positions of the third suborbital bone and the preopercular ridge in *B. barila*, I am unable to attach any importance to one bone *touching*, *nearly touching* or *not touching* the other. Leaving aside the questions of the barbels and the position of the third suborbital bone, I find no other character in *B. barnoides* that can be taken into consideration in separating it from *B. barila*.



Text-fig. 14.—Lateral view of the head of one of Day's specimens of *Barilius barila* (Ham. Buch.) showing relative positions of the third suborbital bone and the preopercular ridge, $\times 3\frac{1}{2}$.

In reaching a conclusion regarding the affinity of his species, *B. barnoides*, Vinciguerra seems to have depended considerably on the short and inadequate descriptions of the allied species given by Günther, Day and others, and this induced him to place his species, which he believed to be non-barbelled, closer to the so-called non-barbelled form, *B. barna*, rather than to *B. barila*, characterised so far with a pair of rostral barbels. From the foregoing accounts of *B. barna* and *B. barila* it is, however, clear that they are different from what they have been understood by Günther, Day and others, and their affinities with related species of the genus must, therefore, be different. At the state of our present knowledge of the three species, *viz. B. barna*, *B. barila* and *B. barnoides*, it is not possible to recognise Vinciguerra's species as distinct from *B. barila*.

In 1893 Boulenger (4) relegated *B. barnoides* to the synonymy of *B. ornatus* Sauvage without assigning any reasons for it. As I am not familiar with the form *B. ornatus*, I am unable to make any comment on its affinity with *B. barnoides*. It seems to me probable, however, that Boulenger knew *B. barnoides* only from Vinciguerra's description and figure.

**Danio (Danio) aequipinnatus** (McClell.)

One specimen (80 mm.) from Tang Hka: '*Nga bit*'.
Two specimens (61 mm.) from Phungin Hka: '*Salap la*'.
One specimen (51 mm.) from Sinan Hka: '*Nga wan*'.
One specimen (30 mm.) from ? : ?

Although at different places different local names are used, all the specimens listed above belong to this species. The specimens have the characteristic colouration of the species and a small flake of a metallic blue near the upper angle of the opercles. In some individuals the lower jaw is papillated.

In 1907, Regan (47) described a new species of *Danio*, *D. browni* from the Northern Shan States in Upper Burma. I have examined the type-specimens of this species preserved in the collection of the Indian Museum, and have found that *D. browni* is strikingly similar to *D. aequipinnatus*. I do not find any stable character that can be taken into consideration in differentiating Regan's species from the other. *D. aequipinnatus* is such a variable species, as I find from an examination of large series of specimens from various places in India, Burma and Siam, that it seems impossible to recognise *D. browni* a distinct form.

Family: Belonidae.

**Xenentodon cancila** (Ham. Buch.).

One specimen (205 mm.) from Tang Hka: '*Singawng tang*'.
One specimen (203 mm.) from Phungin Hka: '*Singawng tang*'.

Two indistinct blackish spots are present above the base of the pectoral fins.

According to the field-notes of Colonel Burton the species is said to grow "up to 3 lbs." The fish is known to grow to a fairly big size. Day (14) observed that it attains at least a foot in length.

Family: Nandidae.

**Badis badis** (Ham. Buch.).

One specimen (40 mm.) from Phungin Hka: '*Nga-teng*'.
One specimen (57 mm.) from Tang Hka: '*Nkrai daw*'.

There are 10 to 11 vertical black bands along the sides. The dorsal fin is tipped with white. The outer margin of the ventrals is blackish.

The species is very variable in respect of the number of spines of the dorsal fin and of the different fin rays. The nature of the lateral line and the colour pattern are also variable.

Family: Mastacembelidae.

**Mastacembelus armatus** (Lacép.).

One specimen (140 mm.) from Phungin Hka: '*Nga lapu*'.
One specimen (200 mm.) from Tang Hka: '*Shayu*'.

Both the specimens are young and they belong to the same species, although they are known by different local names. The fish is said to grow "up to 7 lbs."

FAMILY: OPHICEPHALIDAE.

GENUS: **Ophicephalus** Bloch.

In a recent paper Myers and Shapovalov (44) have shown that in view of the records of occasional absence of the ventral fins in *Ophicephalus gachua* Ham. Buch., *Channa* Scopoli (1777) which has so far been separated from *Ophicephalus* Bloch (1794) chiefly by the absence of the ventral fins cannot be regarded as a phylogenetic entity distinct from *Ophicephalus*, and that according to the relevant rules of the Zoological Nomenclature, the name *Ophicephalus* must be superseded by *Channa*. Although I thoroughly agree, as one must, with the views of Myers and Shapovalov I am for the present retaining *Ophicephalus* for its being an eminently suitable and so very well-known a name. Recently Herre (21) has also retained this name.

**Ophicephalus gachua** Ham. Buch.

One specimen (147 mm.) from Phungin Hka: '*Khumpup Nga*'.

The species is perhaps the hardiest of all its relatives. It has been observed by Deraniayagala (17) that "*Ophicephalus gachua* flourishes in ponds rendered so stagnant as to prove toxic to most fishes. The swarms of tadpoles and mosquito larvae which thrive in these ponds supply food for the adults and fry respectively. The fish is very hardy and exceedingly active on land, progressing by series of leaps. It propels itself into the air by bending its body, planting its tail on the ground and straightening itself with a jerk, and it is a common sight to find these fishes crossing overland, while the pond they inhabit is baled dry by villagers in search of fish". It has also been found in Ceylon to be able to "withstand a considerable range of temperature from the warm waters arising from the hot springs at Kanniya (E. P.) to the cold waters of Diyatalava (U.P.)".

According to the field-notes of Colonel Burton the species grows "up to 2 lbs." This requires confirmation. So far as I am aware the fish hardly attains that size and Day's remarks about its attaining "at least 13 inches" is probably an over-statement.

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